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Delegates at the Agricultural Conference, Cairns, 15th–17th May, 1905.

AGRICULTURAL CONFERENCE.

HELD AT CAIRNS, 15TH, 16TH, AND 17TH MAY, 1905.

An Agricultural and Pastoral Conference, organised by the Department of Agriculture and Stock, was held at the Shire Hall, Cairns, on the 15th, 16th, and 17th May, 1905, and was attended by sixty-two representatives from sixty-three agricultural, horticultural, and pastoral societies of the State. The delegates were—

SOUTHERN DIVISION.

Agricultural and Pastoral Society of Southern Queensland, Beenleigh—J. Savage. Allora Farmers' Progress Association—W. Deacon. Avondale Planters and Farmers' Association, Avondale—C. Thygesen. Biggenden Agricultural and Pastoral Society, Biggenden—F. G. Jones. Border Agricultural, Horticultural, Pastoral, and Mining Society, Stanthorpe—W. Smith. Brookfield and Pullen Vale Farmers, Dairymen's and Fruitgrowers' Association—E. E. D'Alton. Bundaberg Agricultural, Pastoral, and Industrial Society, Bundaberg—A. M. Broom. Bundaberg Council of Agriculture—R. S. Aiken. Central Downs Agricultural and Horticultural Association, Allora—A. Rickert. Chamber of Agriculture, Brisbane—F. W. Peek. Chatsworth Farmers' Progress Association, Gympie—W. Allen. Combined Moreton Association—N. McKenzie. Danderoo Farmers' Progress Association, Danderoo—G. A. Ball. Darling Downs Pastoral, Agricultural, and Industrial Association, Clifton—W. Keys. Deep Creek Farmers' Progress Association, Gympie—E. Wright. Hodgson Farmers' Association, Hodgson—P. Hoskin. Horticultural Society of Queensland, Brisbane—W. T. Bick. Ipswich and West Moreton Agricultural and Horticultural Society, Ipswich—H. E. Wyman. Kilkivan District Pastoral, Farmers, and Settlers' Progress Association—T. Tennison. Killarney Farmers' Association—G. A. Ball. Lockyer Agricultural and Industrial Society, Laidley—A. Hunter. Logan Farming and Industrial Association, Beenleigh—W. G. Winnett. Maroochy Pastoral, Agricultural, Horticultural, and Industrial Society, Woombye—W. W. Burnett. Mooloolah Farmers and Fruitgrowers' Progress Association—T. Hall. Mount Cotton and Redland Bay Fruitgrowers and Farmers' Association, Mount Cotton—H. Heinemann. Nanango Agricultural, Pastoral, and Mining Society—J. Wittman. National Agricultural and Industrial Association, Brisbane—E. J. T. Barton. North Coast Central Association, Dulong—C. Cotterell. Nundah Horticultural, Agricultural, and Industrial Association, Nundah—G. O. Neech. Queensland Acclimatisation Society, Brisbane—E. Grimley. Queensland Beekeepers' Association, Brisbane—A. H. W. Clarkson. Queensland Citrus-growers' Association, Brisbane—B. T. McKay. Queensland Pastoral and Agricultural Society, Ipswich—H. L. Jones. Rosewood Farmers' Club—T. Coulson. Runcorn and Sunnybank Agricultural Society—D. Mac Brair. Southern Queensland and Border Pastoral and Agricultural Association, Nerang—E. Hicks. Tinana Fruitgrowers and Farmers' Association, Tinana—H. E. Bray. Western Pastoral and Agricultural Association of Queensland, Roma—J. M. Hunter. Wide Bay and Burnett Pastoral and Agricultural Society, Maryborough—A. W. Cameron. Woongarra Canegrowers and Farmers' Association, Ashgrove, Bundaberg—D. Watson. Zillmere Horticultural Society, Zillmere—C. M. F. Fischer. South Kolan Farmers and Planters' Association—John Whalley.

CENTRAL DIVISION.

Alton Downs Farmers' Association, Rockhampton—T. Thomasson.

NORTHERN DIVISION.

Aloombah Farmers' Association—N. P. Petersen. Atherton District Farmers' Association, T. Swan. Barron Valley Agricultural, Pastoral, and Industrial Association—W. Marnane. Bowen Pastoral, Agricultural, and Mining Association, Bowen—W. Palmer. Cairns Agricultural, Pastoral and Mining Association—J. G. Fearnley. Cairns District Coffee-growers' Association—R. W. Warren. Cairns District United Farmers' Association, Nelson, Cairns—W. Griffin. Halifax Planters' Club, Halifax—H. G. Faithful. Hambledon Planters' Association—P. Peterson. Herberton Mining, Pastoral, and Agricultural Association—A. J. Draper. Herbert River Pastoral and Agricultural Association, Ingham—

D. Pearson. Herbert River United Farmers' Association, Ingham—W. Berry. Hughenden Pastoral and Agricultural Association—Wm. Hammond. Johnstone River Central Mill Association, Geraldton—Dr. T. F. Macdonald. Johnstone River Farmers' Association, Geraldton—L. J. Moody. Macnade Farmers' Association, Macnade, Herbert River—E. S. Waller. Mossman District League—T. Ryan, senr. Pioneer River Farmers and Graziers' Association—E. Swayne. Stone River Farmers' Association, Ingham—R. G. Johnston. Townsville Pastoral, Agricultural, and Industrial Association—J. J. Fanning.

The Hon. D. F. Denham, M.L.A., Secretary for Agriculture, in the chair.

Officers of the Department of Agriculture.—E. G. E. Scriven (Under Secretary for Agriculture and Stock), J. C. Brünnich (Agricultural Chemist), A. H. Benson (Instructor in Fruit Culture), Howard Newport (Instructor in Tropical Agriculture).

An apology for non-attendance was received from Mr. L. E. Hobler, Rockhampton Agricultural Society.

FIRST MEETING.

MONDAY, 15TH MAY, 1905, 9.30 A.M.

Proceedings were commenced by the welcoming of the delegates to Cairns by the Mayor (Mr. C. McKenzie), which was responded to, on behalf of the delegates, by the Hon. D. F. Denham, M.L.A.

The roll was then called.

RESOLUTIONS.

The CHAIRMAN: At former conferences it has been the custom, I understand, to appoint a Resolutions Committee. The function of such committee being to formulate a resolution embodying the tenor of the discussion. All the resolutions thus framed were brought up for confirmation or rejection at the conclusion of the conference. I have no desire to force on the conference any views that I may hold on the matter, but it seems to me that a more accurate conclusion might be arrived at were the resolution submitted and dealt with by the whole conference immediately after the reading of the paper to which it may have reference. But if the delegates, as a whole, wish that the procedure formerly adopted should be adhered to—namely, that a committee should be appointed, and that such committee should bring up a set of resolutions for presentation at the last sitting of the conference—then I ask you to propose such a committee. But if you think it is preferable that the paper shall be read, discussed, and a resolution arrived at, then there will be no need for a Resolutions Committee. I shall be glad to hear your views on the matter.

Mr. B. T. McKAY (Maryborough): I think, Mr. Chairman, you are to be congratulated on your views with respect to the framing and treatment of resolutions, and I think I am voicing the opinion of the other members of the conference in stating that the arrangement suggested by yourself should be adopted.

Mr. E. SWAYNE (Mackay): I certainly think such a method of dealing with resolutions would be a great improvement upon the management of previous conferences in this matter, and I have therefore much pleasure in seconding Mr. McKay's, and your own, proposal for doing away with the Resolutions Committee.

The CHAIRMAN: I take it that the views expressed by Messrs. McKay and Swayne are those of the rest of the meeting, but, to have the matter in order, will ask you to vote. It is moved,—"That the Resolutions Committee be not formed, and that resolutions be dealt with at the conclusion of the different papers."

Carried unanimously.

The Chairman: I believe on former occasions it has been the custom to limit speakers to five minutes, giving readers of papers ten minutes to reply to criticisms on their views. I think it is desirable to adhere to this five minutes' regulation, although if any one is particularly interesting, and the matter is of very great importance, I feel sure the delegates will not object to an extension of the time. On the platform is a box, which can be availed of by delegates who wish to ask questions. Such questions will, if possible, be replied to. It has been a custom to adjourn for a few minutes during the progress of each sitting. This is a matter of convenience to all, and we may be able to adhere to the custom during the sittings of the present conference.

CHAIRMAN'S OPENING ADDRESS.

The Hon. D. F. Denham, M.L.A.: It gives me very great pleasure to preside at this, the eighth, conference in this Northern city. You will remember that last year no conference was held. This was primarily attributable to the political exigencies that then prevailed. A session of Parliament commenced in May, and it was consequently difficult to arrange for the conference at the usual time in July. I thought then, moreover, that possibly a conference every second year might be sufficient, and I still think that that aspect of the question is worthy of consideration. This time we are meeting in conference in a sugar district in the month of May. I felt the more justified in coming to Cairns and accepting the invitation extended by the people of this district and town, and incur, under our rather depleted exchequer conditions, the increased cost of coming here, because of the fact of the non-holding of a farmers' convention last year. The conference is held for the purpose of business. There is nothing of the picnic in its objects. The questions that will be discussed are of common interest to you all. As the papers introducing the matters for discussion have been prepared by those capable of writing upon the subject, it follows that the discussions will have a good start, or basis, and that matters will be discussed in a logical and concrete manner. We are here to consider such subjects as crops, markets, and how to make the best of our opportunities. There are matters for discussion out of which I have no doubt will arise measures which will be submitted to Parliament. These are matters which will affect public policy, and particularly agriculture. Former conferences have been fruitful in this connection, and as instances I need only mention the Agricultural Bank and Dairy Produce Acts. It is quite likely that out of the subjects to be discussed here this week will evolve matters for legislation. We are opening here to-day the producers' parliament, and I can safely say there is not held during the year a more important gathering than the producers' parliament. We may, therefore, safely assume that the results of our deliberations will be to the material advancement not only of individuals, but also to the whole State. There is one aspect of a conference of this nature, where farmers gather together from all parts of the State—north, south, and centre—which must not be lost sight of, and that is, the fact that the Minister for Agriculture for the time being has an opportunity of coming in contact with representatives from each section of the agricultural community, with each kind of producer, and learning from them, to a greater or lesser extent, the difficulties and aspirations of the producing community. He also becomes familiarised with their proposals for the betterment of their industries. Probably many of you have analysed the programme for the conference. If not, you will find that on the question of land settlement four papers will be submitted; on marketing, two papers; on dairying, mixed farming, and bee-keeping, three papers; on tropical products, two; on matters particularly affecting the sugar industry, three; on agricultural organisation, three; and on improvements in plants, one paper. Of the "subjects" set down for "discussion" four deal with marketing, and one each with the sugar industry, irrigation, pineapples, agricultural organisation, coffee, and honey. It will thus be seen on our agenda-paper we have diversity, and we have intensity. At former conferences it was the habit of the Minister to give a kind

of summary of the progress of agriculture during the year, together with the latest statistics of the crops raised. I propose to depart from that practice to-day, partly because it appears unnecessary, and I say so without any reflection upon my predecessors. In a few months those statistics will be published in complete form by the Registrar-General, and so for me to traverse the Registrar-General's report appears to be a matter of supererogation.

There is a Chinese proverb to the effect that agriculture is the root, industries the stem or trunk, and the profession the branches of the social tree. And, depend upon it, the foundation of all national greatness lies with agriculture. The Chinamen were right, in my estimation, in considering agriculture as the root or fructifier, and that those who were designated as mechanics, artisans, and professional men are those who depend upon the roots. Until recent years it has been somewhat the custom to look down upon the farmer as being of a lesser calibre than the mechanic or professional man. Much, however, as we may decry the Chinese, I think their conception of the social tree, whereby they set agriculture as the root and the other occupations as the stem and branches the correct one. The statement that agriculture is the most ancient and certainly the noblest of all occupations still holds good. Australia is a land of workers, or should be. There are, of course, here, as everywhere else, "loafers" of different types, but the worker is the only man who has a true footing in this land. The worker is the only man who may claim to belong to the social tree. Occupation is said to be one of the pleasures of Paradise, and certainly we cannot be happy in this world without occupation. Agriculture is the one essential work in life, and, being essential, it is the universal one. In late years agriculture has not only taken a high place in the opinion of the public, but in economics. The farmer of to-day stands in a better position all round than he did at any time during the last fifty years. He occupies a higher plane. He lives better. What influences have been at work to bring about this change? The influences have been science, invention, education, literature, and machinery. Take invention: Where would we be without the separator in the dairying industry? What could we do with our great grain products apart from the reaper and binder? Notwithstanding the self-evident impetus education had given to the uplifting of the agricultural industry, there were still some, strange to say, who asked—"What is the use of all this teaching? What is the use of these experts? Our fathers prospered, and we would prosper if we were assured of better markets. All this talk about science has nothing to do with our occupation." Such is the line of thought adopted by many. The day, however, is passed when a farmer, of all people, can talk slightingly of the scientist or the chemist. So that this may be more fully carried to your minds, I may be pardoned for referring to the work done by the chemist in connection with the beetroot in Germany. They were growing beet in Germany, and found they had vastly exceeded the requirements of the consumers of beet as a food—as a salad. The chemist set to work and evolved a method of extracting sugar from the beet which, for the last year for which statistics are available, was worth 14½ millions of pounds sterling to Germany. The chemist was the man who demonstrated to the grower how much more could be done with the potato than by using it simply as an article of food. In Germany, in 1901, the crop of potatoes raised was 48,500,000 tons, and it may well be asked what could be done with such an enormous crop. If the chemist had not come upon the scene such a crop could not have been utilised, simply because it never could have been consumed if only put to the use to which potatoes are put to in this State. About one-half of that quantity is used in the German confederacy in human consumption and stock-feeding for export trade. But the chemist showed other uses for the potato apart from the use as a direct human and animal food. The chemist has given us from the potato an alcohol; a spirit for driving engines and motors; a spirit for lighting, for heating, and for cooking. No less than 2,000,000 tons are used in Germany in distilling, the residue from the distilling operations being used as a

cattle food. No less than 2,000,000 tons annually are used in the production of starch. In addition, there is manufactured from the potato starch, syrup, flour, dextrine, &c. The export of starch and potato flour from Germany is not less than 46,000 tons annually, and of dextrine 14,000 tons. Apart from the chemist this could not have been possible. Science tells us what pays best, and how to secure a crop. Those who take the *Queensland Agricultural Journal*—and I wonder that there are any farmers in this State who do not take it—will remember that in it appeared a short while ago an interesting article on soil inoculation. There we are told you can buy for a few pence sufficient nitrogen fixing bacteria to inoculate from one to four acres of land. This bacteria can be carried in a packet in your waistcoat pocket. It has been known for ages that the most important element of plant life was nitrogen, and it has been known for ages that plants deplete the soil of nitrogen. The result was that costly manures had to be introduced, but Dr. Moore has now discovered how it is possible to inoculate the soil for the small cost I have indicated, and thereby enormously increase the cropping power of such soil. There is no occasion that I should long dilate on this subject, because it appears to me that we cannot in this age afford to think slightingly of the scientist.

Another factor that has been operative in the uplifting of the agriculturist is that of literature. Even our great daily journals often have articles dealing exclusively with agriculture, which is significant of the trend of public opinion with respect to the farming industry. The work of inventors and others I have already referred to, so that we find that all along the line the best minds of to-day are deeply working how to make lighter and more profitable the lot of him who is winning wealth from mother nature. Agriculture is a vital living movement. The goal of to-day will be the starting-point of to-morrow. There is no such thing as stagnation. All the time we are moving forward, and if we are to keep abreast of those in other parts then we must keep in touch with advanced ideas.

The organisation of agriculture will be the subject matter of the writer of more than one paper at this conference, and may therefore be only briefly touched upon now. In the old days, the agriculturist was strictly insular. He built a fence round his farm and around himself. But now farmers come to recognise how advantageous it is for them to come together politically and secure advantages—concessions to which they are entitled, but which they otherwise could not obtain. We can only do our best, and I am well aware that we have many factors in nature to contend with. But as Addison said—

> "'Tis not in mortals to command success;
> But we'll do more, Sempronius, we'll deserve it."

We cannot control the rain or the dew, but we can prepare our movements and work so that when the rain and dew come down we shall get the full benefit of their benign influence. We must make intelligent use of our opportunities—patiently, prudently, and perseveringly—and I may mention a case illustrative of my meaning: In our Southern district, lucerne was a payable crop to raise for our market, but that day is passing. I admit that in certain districts near to Brisbane certain farmers are yet able to place lucerne hay on the market and realise something for their labour, but generally speaking the day of lucerne hay as a profitable crop is passing. It therefore behoves those who have lucerne land to make an intelligent use of their opportunities, and not simply press their hay and send it to market and realise a mere pittance, but put the lucerne into the milking bucket or into fat lambs. Coming to these great sugar districts, concerning which I am afraid I have but too little knowledge, what is wanted are some subsidiary crops to grow, so that when your men are not engaged in connection with cane they may be profitably employed in other culture. In the Mauritius, where sugar occupies the same position that it does in North Queensland, they are growing the Fourcroya, an inferior species of the Agave, and by so doing they profitably employ their labour in the off season

for cane. I do not know whether it would be profitable to grow sisal fibre here, but have an impression that it would be so. I can tell any gentleman who is interested in the matter what are the results likely to be realised from sisal, and so forth. If it is found possible to grow the sisal here, then that may be the means of holding in the North the labour that you require in the height of the season for cutting and trashing. If the planter can find anything to engage his employees during the slack season, even though the labourers are only earning their own wages, it would be of material advantage, because he would have around him an assured number of men for the busy season. That is what I mean by making intelligent use of opportunities. Now, the cattle man understands how foolish it is to be feeding a cow that will give only a gallon of milk a day when he can get an animal that will give two or three gallons. He understands that it is folly to milk only once a day when he should milk twice. The old-fashioned days are passing away, and if we make intelligent use of our opportunities I have not the least shadow of a doubt what the result will be. There is no occupation in life that gives so wide a scope for the exercise of the faculties and for the exercise of the intelligence as that of farm life. It used to be said that you send the stupid son to the parsonage. But in these days, if there is a stupid son the farm is not the place for him. It is the intelligent man who is wanted on the farm, and it is the intelligent man who makes the most of the farm. It is a question of adaptability, and a man must lay himself out for what his farm is best adapted for. He must consider the soil, the climatic conditions, and the proximity to markets. Then what aspect of culture does he take the most interest in? and, having done so, he has surely a wide range from which to select the particular lines to which he will apply his farm and his ability. Having selected those lines, he will see that his soil and general conditions are calculated to bring about the best results. The farmer who takes a pride in his business is the man who is making the most progress. It is something to have a brand, and for buyers to inquire for that brand. There are always careless men. The good men are making the market, and the careless man is always creeping in on that market. But let not the careful man fear, because if he has made a reputation he will always get in the long run the benefit of his work. Study market requirements and peculiarities. The English market requires products got up in a certain way—prepared in a certain manner. They like a lamb that will weigh from 36 lb. to 38 lb. What use is it, therefore, for us to raise a lamb that will weigh about 44 lb.? The English consumer prefers white-legged poultry. You can grow the white-legged as cheaply as the coloured, therefore grow it. Whatever the buyer wants let him have. A horse enthusiast was talking to me about the breeds of horses, and was exceedingly earnest about the Arab; but I said, "Is not the Arab usually grey or flea-bitten, and are not such colours unpopular with the foreign military authorities, who are our best buyers?" "Oh, yes," he replied: "but the grey horses could easily be put through a khaki bath prior to going into battle!" If the buyer wants an article produced in a certain way, and he is the man who is paying for it, then shape your product accordingly, and produce what he likes.

I have indicated some of the lines along which we may look for success. On these and kindred topics our agenda-paper deals. We are here to exchange our views. We are here, if possible, to arouse an intelligent enthusiasm in our occupation. We are here to indicate, if we can, the better paths along which we may travel. We are here to stimulate and conserve the agricultural industry. What is the relation of the State to the agriculturist? In this State of Queensland the Crown is the largest landowner. It is largely the landlord. The Crown is practically the owner of all the railways in the country, and the State is therefore the common carrier. Inasmuch as the State is the sleeping partner of the agriculturist, I am here to-day as the head of my Department and as one of the administrators of the State to hear your views—to hear what you want to do, and to hear the lines along which you desire to see this great busi-

ness partnership conducted. What should the State do for the agriculturist? The State should educate the agriculturist; should advise him, and should conduct experiments. The State should foster agriculture—but when I say foster I do not mean spoon-feed. It will be a sorry day when the sturdy agriculturists lean upon the State to any extent. The agricultural community is about the only direction towards which we look to see the old sturdy stock surviving, for in nearly every other walk in life it is a case of leaning against the State to an inordinate extent. But there is such a thing as fostering and helping those who are walking along the line, and I may cite one single instance. Take the poultry business. The possibilities in Queensland in the poultry line are simply unique and enormous. We can hatch our eggs in about July or August; let the chickens come along to the cropping time in October; let them go into the fields as gleaners, and afterwards for a few weeks give them a good close stuffing. If you put them on the market in January, and ship to Great Britain, you will strike the best market that the old country has. There is no land that can raise poultry as cheaply as we can. In the United States they have to keep them for a large portion of the year in warm rooms, but we have none of that here. A few months ago I saw the possibilities of this, and sent out a lecturer to arouse interest in the industry. We then had collected a few hundred head of poultry, which we sent home, and since I came North I have received the following telegram from Brisbane:—"*Courier* this morning states shipment Queensland poultry by 'Damascus' placed on market; ducks realised 2s. 6d. to 2s. 9d.; best chickens and capons, 3s. 3d.; and turkeys, 7d. to 9d. per lb." That is a very big advance upon the prices in the Brisbane markets, and will leave a satisfactory result to the shipper. Moreover, we may expect that when we get better known that we shall do better. That is an instance of what I call helping or fostering the farmer. There is no spoon-feeding about it. The farmer paid every penny incurred in connection with that consignment. But, independently on his own, he could not have brought about the shipment. But the Department, by indicating the proper lines, has been able to show that there is a good market in the old land for the subsidiary crop of poultry.

If the State should thus act towards the farmer—and I say it should—then I think there should be reciprocity. It will be remembered that I designated the State as the sleeping partner. The farmer is the active partner, and has to attend to details. He should make experiments, watch those experiments, and in due course communicate the results thereof to the Department. I want the Department to be the heart of the great system, and I want to get into touch with our farmers through the length and breadth of the State. If they have anything to communicate, I hope they will not hesitate to send it along. The value of the Department would be greatly enhanced if it had more active co-operation from many of your associations. Some of these bodies seem to have only one object, and that is to have an annual show. If that, however, is their object, they fail in their mission. The associations would back up the Department immensely if they had more frequent meetings, at which papers might be read, addresses given, and discussions allowed. The members would get to know one another more; they would get to learn the newer ideas, and how the various systems were operating in different directions. If the members came together even once a quarter, and gave their experiences in regard to cropping, their results in respect to stock-raising, and brought small-exhibits of their crops, then I believe your organisations would be live ones, and, combined, they would be a big power in the land. There is no reason why the associations should not combine. Even pecuniarily such combination would pay, for there is no reason why the combined body should not get for its members in wholesale quantities such articles as fertilisers and seeds.

I have spoken rather longer than I should have done, but I wanted to mark out the lines along which success awaits those who go upon the soil. I again ask you during the conference to give the closest attention to the busi-

ness that may be brought forward. I am sure the conference is for our mutual good and for the good of the State. I believe it can be made an interesting conference, and as useful as any previous conference. At the last session of Parliament two Acts were passed which practically grew out of former conferences. Those who were at the last conference will remember that Mr. Fox read a paper on the amendment of the Agricultural Bank Act. Last session I had the pleasure of piloting through the House an amendment to the Act, which practically embodied the views expressed by Mr. Fox and the other delegates to the Maryborough Conference of 1903. Personally, I feel assured that the Agricultural Bank Act as it now stands is one of the most progressive Acts that stands upon the statute-books of any of the Australian States. Then the Dairy Produce Act also may be said to have grown in some degree out of the conferences. For years the subject lay dormant, but last year we placed among our laws an Act which must be for the benefit of those engaged in dairying. If this conference is as productive in good as former conferences, it will carry with it its own tribute of success. (Applause.)

Mr. E. Swayne, of the Pioneer River Farmers and Graziers' Association, Mackay, then read the following paper on—

THE SETTLEMENT OF TROPICAL AUSTRALIA—AGRICULTURAL MEANS THERETO.

[By E. Swayne.]

In view of the facts that our tropical coast is some 5,000 miles in extent, or roughly half that of the whole continent; that within the tropics, with the exception of a few comparatively unimportant districts situated principally in the south-eastern portion of this vast and, to many foreign nations, attractive region, it is devoid of anything approaching close settlement, its north and north-western parts being practically uninhabited; and that these particular parts lie almost as near to the seething masses of Asia as they do to our own relatively more populous South-eastern States—for instance, Port Darwin is as close, allowing for the detour round the coast, to Canton as it is to Melbourne—you will, I think, agree with me when I say this subject is one of most pressing national moment. Personally, with all due deference to our legislators, it seems to me that a considerable portion of the industrial class legislation that, since its inception, has occupied so large a portion of the Federal Parliament's time is but a trifle compared to it. In considering the various means for filling this dangerous void in our continent, agriculture is without doubt the means best calculated for the attainment of our object. Its advancement all over the civilised world is looked upon as the basis of national security. Great Britain to-day is anxious, because, owing to its agricultural industries being in a great measure supplanted by others, it is dependent upon oversea sources for much of its food supply. Germany, in order to encourage agricultural production, with its sound-constitutioned vigorous humanity, so desirable a recruiting base for its army, until recently submitted to a heavy impost on such an important foodstuff as sugar; and many such instances of the important place it occupies in a people's estimation could be given. In Australia, with about one inhabitant to every square mile of its great territory, without the population first necessary to afford the home market requisite, before our budding manufactures can attain a scale of sufficient size to enable them to compete in outside markets, agricultural development becomes a question of the first magnitude. We have, it is true, other primary industries capable of assisting us in our work of getting people on the land, such as the pastoral and mining industries; and to the former we chiefly owe pioneering in Australia. Still it must be admitted that its attendant population is but scattered, while, although mining frequently leads to close settlement, unfortunately it is often not permanent in character. I say this in no deprecatory spirit towards these two great interests. The allusion is made simply to assist us in gauging the means we have at hand for our work. As to the products that have already given us reason for the opinion that in them lie the factors for inducing agricultural settlement in the parts referred to, we have sugar, coffee, cotton, cigar tobacco, rice, fibres, fruit, and spices, most of which, when compared to the crops of temperate climes, require a more or less large proportion of hand labour. Taking them in the order named, and also as the most important, the first is sugar. Its production in Queensland

commenced during the early sixties, and it has already attained considerable dimensions. In 1903, 111,516 acres were under crop for milling purposes, and the value of the machinery and implements employed in the manufacture and field production amounted to £4,000,000. For the season just passed (1904), the crop of about 148,000 tons is valued at £2,080,000. Out of the smaller crop of the previous year there was exported to the other States sugar to the value of £647,558, and for home consumption £451,199 worth—a total value of £1,098,757, not including molasses and other by-products. During that year sugar compared with our other agricultural exports as follows:—Grain, fruit, and vegetables, £198,891; dairy produce, £52,004; but these two items were in a measure counterbalanced by imports to the amount of £155,531 and £87,074; while the value of the total wheat crop of Australia was £12,000,000, or not twelve times that of the sugar produced in the eight or nine cane-growing districts of Queensland. The numbers of hands at present employed by the sugar industry is, during the busy time, about 22,500 white men and, all the year round, 7,500 kanakas, exclusive of other coloured aliens, Asiatics, who are growing cane on rented or leasehold lands. These few figures show the employment of labour and investment of capital resulting from this industry while it is still confined to a few districts along the Queensland coast, and they afford good grounds for asserting that, under suitable treatment, it can be expanded into an industry of the first importance to the whole of our Commonwealth, by an export whose sale returns will add largely to the community's ability to expend large sums in railways, harbours, and other reproductive public works. Before, however, dealing further with the future possibilities of this industry, it may be as well to touch on the legislative features under which it has existed up to the present. Very soon after its commencement, some form of tropical labour was found necessary; South Sea Islanders were introduced, and, with the exception of an Act passed for their exclusion in 1885, which it was soon after found necessary to rescind, continued to be the principal labour employed in cane-growing until the Federal anti-kanaka legislation of 1901 came into effect. On the passing of this Act it was decided to grant to the sugar-growers, as compensation for the largely increased cost of production entailed thereby, a rebate of £2 per ton of sugar out of the £3 excise duty that was also then imposed. This compensation works out to the grower at from 4s. to 5s. per ton of cane, according to the district in which he resides, the larger amount being paid in the North. That this rate of compensation is not extravagant, and also that, without it, the industry will cease to be of any importance, is shown by some figures recently collected in the Mackay district, which, from the rate of rebate bonus of 4s. 8d. per ton payable, may be regarded as an average. These figures showed that on scrub land it cost 6s. 6d. per ton more to grow and harvest a crop of cane by white labour than it would with kanakas, and 5s. 6d. more on forest land, the value of the cane without the bonus being from 12s. to 16s. per ton. Under these rebate bonus conditions the following proportions of the Queensland cane crop have been harvested since they came into effect in 1902. In that year the proportion was 16½ per cent.; in 1903, 25 per cent.; and in 1904, about the same, the balance being harvested by coloured labour. But while the Southern districts largely availed themselves of the new system, the North did not grow enough under it to keep one mill going. In fact, where the greatest need for population exists there seems no prospect as yet of its success even as merely a factor in home consumption; also from Mackay northwards there exists at present an ominous disposition to transfer cane farms on lease to coloured aliens, such as Hindoos, Chinamen, Malays, &c. As an instance, it can be shown that in Mackay, during the past two years, while doubt as to the future of the industry has prevailed, settlement by Asiatics has doubled, while that by Europeans has increased by only 16 per cent. This, then, is the present position of the sugar industry. Continue the bonus, and New South Wales and Queensland will possibly still produce enough for Australian consumption, but the production will be chiefly in the southernmost of the districts now being worked or where other branches of agriculture could also be advantageously followed. Even in Mackay, where there is a promising future for the dairying industry, there will be a decrease in sugar acreage, although during the two past seasons a considerable portion of the cane crop has been worked satisfactorily by white labour, because on the steep hillside scrub lands the white man is naturally disinclined to handle heavy cane under a hot sun, and is at a disadvantage in such a place as compared to the barefooted islander. Some of the wet flat land will also go out of cultivation, as, during the best planting months of February, March, and April, it is frequently, through its swampy character, too wet to work on; during

May, June, and July, this class of soil gets very cold, consequently a large proportion of the plants will not germinate if planted then; and August and September, when such land has generally being planted, are two of the busiest months of the harvest time, and the most sanguine will hardly expect that, after the deportation of the kanakas at present working here, there will be sufficient labour available to simultaneously carry on the cane-cutting and the time-occupying operation of planting, as already mentioned. In this particular district, the decrease in cane areas will be more than made up by increased activity in dairying and pig-raising; and if further reason is required for the statement that any expansion of the industry is impossible under present conditions, it is furnished by the narrow margin existing between local demand and consumption—a margin that with the approaching good crop will probably vanish, and with its disappearance there will be a consequent fall in prices to export values which, if not as low as the £8 5s. per ton of the past four years, yet is still insufficient to allow us to think of export as a safety valve with the present high cost of production. Then there is the other future possible to Australia in connection with this industry—that lying in its development into a great export. It is asked, perhaps, Can you do this, even with the kanaka? His cost of 2s. 6d. per day is high compared with that of the coolie in other cane-sugar countries, and the supply obtainable from the South Sea Islands is limited. True, but we have New Guinea still closer and partly under our own rule as a source for recruiting similar labour, and we must also bear in mind that very low-priced labour is not always cheap. There is sometimes a tendency to extravagance in its handling. In our Queensland cane-fields we work with a happy combination of hand labour and horse implements of the latest patterns procurable, in a manner which is unknown in other cane-sugar countries, with the exception of Hawaii and Louisiana, neither of which are among our possible competitors, while present home prices are considerably higher than the £9 8s., £9, and £9 10s. 10d. for which our two most northerly mills turned out their last crop. That London prices will remain as they are, is, unfortunately, not likely, owing to the abolition of the bounties on beet sugar and unfavourable seasons in Europe; consequently cane-sugar countries everywhere are increasing their sugar areas, but, with the cessation of State bounty to our great rival, it is not likely they will ever again touch the low level of years ago, and it is quite possible that means of still further economising may be open to us. Now let us look at the possibilities for all classes of workers in Australia involved in this exporting future—say, with an output of 1,000,000 tons, which is equalled by one island in the West Indies—Cuba. Such a production, after deducting, say, 200,000 tons for home consumption, would leave us 800,000 tons for export, a direct yearly addition to the communities, outside sales on present values, of £8,000,000, or approaching half the value of our great national product—wool. And money earned in this way makes money. The initial capital outlay in the purchase and erection of the mill machinery necessary to deal with such a crop on the basis of £8 per ton of yearly mill capacity, and assuming we have already enough mill capacity to deal with 200,000 tons of it, would be £6,400,000, with a like outlay on the field operations before the first crop was finished. What this would mean to our iron trades may be realised when we remember the number of hands there were employed by one foundry in Maryborough when making three or four of the mills now working under the Sugar Works Guarantee Act. The means to thus increase our national wealth would be the presence of about 35,000 South Sea and New Guinea men, but with them, as a result, two to three times their numbers of adults of European race. In other words, a substantial step towards the erection round a hitherto unprotected border of a living bulwark in which men of our own colour would be the predominant element. Still, looking at the subject merely from its economic standpoint, and basing my deductions on figures, recently published in Mackay, extending over a long term of years, 90 per cent. of the yearly wages paid in connection with the direct sugar production would go to the white worker in addition to the earnings of those employed in the various towns, such development would bring into existence. But, without the above proportion of tropical labour, anything of the kind is impossible. Figures already given show the cost of production under solely white labour conditions to be prohibitive for anywhere but our own protected market, while the countervailing agreement entered into by the Powers at the Brussels Convention prevents any aid to export in the way of bonus even if our own people were willing to grant such.

Of the other tropical products mentioned, coffee has already demonstrated its ability to thrive in most of our coastal districts; but, so far, it has been unable

to anything like supply our home market for reasons that we ourselves control. In 1902, 314 acres were grown for a yield of 113,301 lb., or 2,386,699 lb. short of the Australian consumption of 2,500,000 lb. With an addition of 2d. to the 5d. and 3d. per lb. protection they already receive respectively on raw and manufactured coffee, growers in our district tell me they could considerably expand their operations. In fact, with this help, the Commonwealth could produce sufficient for its own consumption. That such protection is necessary is shown by the very low rates ruling for agricultural labour in the countries with which we compete. And again we are face to face with the question, Shall we, with our large areas suitable for such a crop (Mr. Draper and the other Cairns men in the room can tell you how vast they are), allow this industry to linger on in its present small way, or shall we so assist it so that Australia will at any rate give her own producer the chance to provide her with her own cup of coffee which will be far superior to a lot of the stuff at present imported under that name? Or will they allow full liberty to apply our tropical scrubs to the purpose for which Nature intended them, and convert this industry into another of their large exports?

With cotton, again, there is no question of natural adaptability. Years ago, in the South of Queensland, during temporary high prices, large quantities were grown. In the North the valuable Sea Island variety thrives, and Dr. Thomatis, at Cairns, has produced a hybrid which was valued highly in England by experts, while about Port Darwin it grows wild. In the cost of production lies the whole question. Our Minister, speaking at Brisbane in March last, told us that the minimum price at which it would pay to grow was 1½d. per lb. in the seed, and since then I have been pleased to hear that the Government are prepared to gin it and guarantee that price; but if we wish to see it occupy a permanent position in our prosperity we must be prepared for a fall in prices, and also remember that, if it can be carried on profitably solely with whites in the South, it by no means follows that the same thing will be practicable in the North, and that is more particularly the portion we are seeking to provide for. As Great Britain purchases two-thirds of the world's cotton crop, Mr. Chamberlain's preferential trade policy could be of great assistance to us, but we must still remember and be prepared for competition from such countries as British Africa, populous and lying nearer to Manchester than we do. Cigar tobacco, Mr. Nevill, our very able tobacco expert, tells us, will do well in many spots between St. Lawrence and Cairns; but, again, here is a crop requiring a lot of hand work, and although Mr. Nevill advises us that the price for the high-class leaf we could produce will enable us to pay the wages now ruling, still it seems, in face of the figures recently published in the *Agricultural Journal*, showing that out of a male population of 226,000 only 12,068 are available for farm labour, that we have not sufficient of it in the State to provide for any great agricultural expansion. As it is, southern farmers often complain of insufficient hands at harvest time. It might be as well here to refer to the system of family labour, so often advocated as a means of overcoming agricultural difficulties of this sort. That our children who have an aptitude for it should take to farm life, I think we all desire. But for it to be impossible for a man to get a living out of the land without a family of children to do the work he cannot get anyone else to perform, is most certainly not desirable. For small children it means neglect of their education, and so must place the rising generation of agriculturists at a disadvantage when compared to town dwellers in a corresponding social position, who can get a living without necessarily depending upon their offspring for it. If a lad has talents for a profession or a leaning towards a commercial life, it seems very hard that because his father is a farmer, and, therefore, requires his services at home for field work, he should be debarred from the same freedom in following the bent of his inclination as other children. In fact, such a system can only result in an increase in the inclination so constantly deplored to seek in the towns for a living instead of going on the land and earning it in primary production.

Returning to our list of tropical crops, rice has been grown successfully, both in the South as well as here in the North, and again it is not a question of natural adaptability, but of cost of production. The present federal import duties on it do not seem sufficient to enable us to produce it for our own use; and, to export it, we should have to face competition with some of the lowest-priced labour in the world.

As this paper has already run into a length I did not contemplate when I began writing, and also as my own practical experience has been confined to sugar, and there are men present better able to deal with the other products named than I am, I will not add to its length by further reference to them than to say

they have all given more or less evidence of their capabilities as assistants in our work of settling Tropical Australia. In so doing, if we have not the advantages of other tropical countries in the way of very cheap coolie labour, we have others in the ability to utilise horse or mule work already alluded to and virgin soil to work on. Before I finish, I should like to state I hold no brief for the employment of coloured labour if it can be done without. The association I represent looks upon white labour in the canefield as being under trial. They are giving it a fair trial, but until further evidence has been furnished that, on the removal of the 1,200 kanakas at present in our district, the white man can fully take his place, they look upon the question as still unanswered; and, fortunately, in our district if it is necessary to restrict our sugar areas we have dairying and pig-raising to fall back on. The action we have taken so far is to ask the Federal Government to continue the bonus and postpone the date for deporting the kanaka for a long enough period to give the new system a fair trial.

In conclusion, I would ask all who have heard this paper to look our position squarely in the face without prejudice. Here we are, a comparative handful of less than 4,000,000 trying to monopolise a continent. Unless we can get reinforcements to our numbers from outside, how long are we likely to be left to our own devices? Most certainly only as long as the British Navy is left free to protect this distant corner of the Empire will this, to many nations attractive, Northern littoral of ours escape their closer attention. At the present time there is not even a picket boat patrolling it. What influx is already taking place it is impossible to say. Both Dr. Roth in his recent strictures on the conditions of the blacks in Western Australia, and Sir John Forrest in his reply thereto, spoke of its exposed position; and it is significant that there is no reluctance on the part of leading Chinamen in our midst to lease land or undertake contracts involving the presence of large numbers of their countrymen.

Beyond the internal and economic aspect of the subject, it is one of international importance. In it is wrapped up the question, and, as we deal with it, so will our chances of handing intact the control of this continent to our children depend. Now is a favourable time; great staples like sugar and cotton are realising a fair price. We are in a position to say to small capitalists in the old country or to the agricultural labourer wishing to commence farming on his own:—"Come to us. We will give you land and other advantages which will enable you to acquire a competence, not condemn you to a life of anxiety and worry." This policy would be preferable to the present system of robbing Peter to pay Paul now being followed—one State trying to deprive the other of the class that they all require. Why not try and rival Canada, with its yearly addition of over 100,000 people? Or shall we be content with the paltry 1,300 now yearly seeking our shores, wrapped up in a false feeling of security, content as long as industries, which might cause huge investments of capital with the accompaniment of thousands of people, give us enough sugar to sweeten our own small cup of tea. We are now at the parting of two ways; if we do not take the right turning, we may rest assured that someone else will take the running from us.

Mr. SWAYNE (Mackay): A meeting of sugar-cane growers was held last night, and a series of resolutions was then decided upon. These resolutions do not emanate from any individual, but from the whole body at that meeting. As other persons and districts are concerned in them, would it not be as well to take those resolutions at the end of the last sugar paper? I have been asked to make this suggestion and also, when the time comes, to move the resolutions.

Mr. H. HEINEMANN (Redland Bay) suggested that resolutions affecting sugar-growers be dealt with by sugar-growers only, and that a similar policy be adopted with regard to resolutions affecting other branches of the agricultural industry.

Mr. F. W. PEEK (Queensland Chamber of Agriculture): Mr. Swayne has mentioned not only sugar in his paper, but other industries which are affected by the Commonwealth law, which prohibits us from importing labour under contract. It is not my wish to debate that point, but it is on the question of labour for agricultural purposes that the Federal Act restricting the introduction of labour under contract will have to receive our earnest consideration.

The Chairman: It will be noticed that the pride of place at this Conference has been given to sugar. We recognise that sugar is king in the North, and, hence, it has been placed first on our agenda-paper. Mr. Swayne's suggestion appears to be a good one. As sugar is the subject of the first day's consideration, and as, doubtless, there may be papers somewhat traversing the paper by the representative from Mackay, it may be well to delay until the close of the day's deliberations any set of resolutions which the sugar men desire to submit to the Conference. I value Mr. Heinemann's suggestion, but think it is undesirable to divide the Conference up into sections. One of the motives that decided me to come North was that there was a desire to have a Northern Conference independent of the South. The State, however, is one whole, and now if we divide up and put ourselves into sections, I think many of the main objects of the Conference would remain unachieved. Naturally, those who are not intimately acquainted with sugar will be influenced by the arguments of those who are so interested, and that will lead us to a sound conclusion. It will expedite matters and lead us to a better conclusion to adopt the suggestion that we take at the close of the day the resolutions dealing with the sugar industry.

Mr. E. S. Waller, of the Macknade Farmers' Association, Macknade, Herbert River, then read the following paper on—

WHITE AUSTRALIA AND THE SUGAR INDUSTRY IN THE TROPICS.

[By Edwin S. Waller, Manager, Herbert River.]

Being a sugar-planter and having lived for thirty-four years on the Herbert River, North Queensland, which is a truly tropical climate, I think I may justly claim to have had considerable experience of the climate, and that I should know something about its suitability for white labour for field work.

As this is a very critical time for the sugar industry in North Queensland, it behoves us to consider the matter seriously. I am anxious to place before this Conference some of my views, and bring forward a resolution which, I trust, will be carried unanimously.

The important question at the present time (which concerns all interested in the sugar industry, especially in North Queensland) is: "Is this industry to be allowed to die out?"

Sugar in this State last year was worth £2,000,000.

The people who live in the Southern States, New South Wales, Victoria, and even in South Queensland, have a totally different climate to live in, and, therefore, cannot understand what effect a very hot and moist atmosphere has on the European constitution. Those who, like myself, have lived here for a number of years, and do know, will tell you that malarial fever is at times very prevalent, the climate is extremely enervating, especially to women and girls, who are compelled to make periodical visits to southern and cooler climates in order to restore their health. The effect on the men is similar: they must have occasional changes and spells. If the question were asked of medical men who have lived for a number of years in the tropics: "What is the effect of the climate on a European constitution?" I believe that five out of six would say that the race would in time degenerate.

White men are able to do all the mechanical and skilled work, also the horse-driving required for cultivation, but for other field work I have found them unreliable, and I maintain that white labour for field work in North Queensland has been fairly tried, and proved unsuccessful.

If the cane-growers in North Queensland are debarred from using coloured labour for field work, the sugar industry must collapse, or, as an alternative, the Chinese and Japanese will come and take the place of the European farmers. I ask: "Will this benefit the white Australian cause?" I would point out that in no other tropical part of the world is sugar grown without the aid of coloured labour; and, this being so, why should the Commonwealth Parliament try to go against the laws of nature, and expect Europeans to do the work they are not suited for?

What is the answer to the questions: "Why are all tropical countries peopled with coloured races?" "Can the Creator have made a mistake?" The answer is plain enough. They are adapted to the climate, and they were created accordingly. Then why on earth should they not be allowed to help us to open the country and develop its resources?

If the European has courage and pluck enough to live in the tropics, let him be allowed to civilise and make use of the races that are suited to the climate, for by doing so he is also giving employment to a very large number of his own countrymen. By doing this the country must go ahead by leaps and bounds, and an enormous revenue would be derived.

There are thousands and thousands of acres of splendid land in North Queensland now languishing for want of development, not only for sugar, but for coffee, spices, &c.; at the same time, there are millions of British capital and a very large number of British subjects available for developing the same, but who are now debarred by this mad craze for a White Australia. The deportation of the kanakas now in Queensland is a cruel and gross injustice, not only to the planters and pioneers who have invested all their money in the country, but to the kanakas themselves, who are, many of them, married to women from different islands to themselves, and have families. They have been civilised and Christianised, and if sent back to their islands are likely to be murdered.

If the Commonwealth Parliament want to do some good to the country, let them appoint a commission to make all inquiries about the latest scientific researches for the best means of destroying the mosquitoes, and give all local authorities the information required as to how it can best be done. If this were done, and from what we read it is now possible to do it, an infinitely greater boon would be done to the cause of a White Australia than by sending away the kanakas.

It is to be hoped that the members of the Houses of Senate and Representatives, who are now about to visit North Queensland, will have the true facts of the sugar industry pointed out and explained to them. If they really wished to judge of the suitability of the climate of North Queensland for white labour for the sugar industry, they should have made their visit during the month of November, when all the work of cutting and crushing would have been in full swing; besides, what is most important of all, they would have been able to realise a little better what a tropical climate is like. As it is, they are coming up in May, which is one of the pleasantest and most temperate months of the year, and one in which the mills are not working.

Mr. Waller's paper was succeeded by an address by Mr. W. GRIFFIN, of the Cairns District United Farmers' Association, Nelson, Cairns, on—

THE NEED OF AGRICULTURAL LABOUR FOR THE CANEFIELDS OF NORTH QUEENSLAND.

[By WM. GRIFFIN, Nelson.]

Although this is a subject which has been debated threadbare, it is of such vital importance to all interested in the sugar industry in the North that it calls for constant agitation, in order that the Northern white planters do not give place to Chinese planters.

It must be borne in mind that the white cane farmer has established his present holding and position by the aid of kanaka labour, and while not being hostile to the discontinuance of the immigration of kanakas, the prospect of the six or seven thousand kanakas leaving the canefields in so short a time and in such a sudden way is causing intense alarm among the majority of the cane-growers of the North, they being at their wits' end to solve the problem of finding sufficient of white labour in the short space of two years.

It must be recognised that the finding of, say, 5,000 white agricultural labourers to work the canefields within two years is a greater task than the cane-growers are capable of coping with, and they appeal to the Governments, both State and Federal, to assist them in this (as they believe) their great trial.

It cannot be overlooked that a large area of sugar-producing lands is fast falling into the hands of Chinese lessees, which is a position of affairs repugnant to the ideas and aspirations of nine-tenths of the European sugar-growers, and which position must, in the opinion of Northern sugar men, continue and increase, the result will be that the last stage of the sugar industry will be worse than the first. This state of affairs will be brought about by the fear that now exists, and is likely to increase, that the white labour obtainable for the canefields in two years' time will be so limited that the landowners will lease to aliens in order to avoid loss, if not ruin.

There is no question of the white man's ability to work in the canefields, the real trouble is that there are not enough white men to be got to deal with all the cane now grown. It has to be borne in mind that the cane and wheat

harvests happen during the same period of the year, such circumstance demanding a large supply of hands; and it is a natural thing that the wheat-growers, being near the thickly-populated portions of the State, will get the first benefit from any labour offering, and the sugar-growers, the Northern men especially, being settled in the sparsely-populated portion of the State, have certainly a poor show of getting the desired number of hands during the busy and important season. Another important factor is that the meatworks and shearing operations commence generally a few weeks before the cane-crushing, and any surplus labour that may possibly be offering will undoubtedly be snapped up at those works.

Strictly locally there is, roughly speaking, a capital of £200,000 invested directly in the two sugar-mills existing, and another £100,000 in the Cairns-Mulgrave Tramway, and which is dependent on the successful running of the two sugar-mills for its own success, so that, in round figures, we have a sum of, approximately, £300,000 invested in connection with the sugar industry in the Cairns district alone, and about one-half of this sum has been borrowed from the State Government of Queensland, a condition which causes the State Treasury to hold a relative interest in the welfare of the industry.

It may be asked: Why do not cane-growers register for rebate as opportunity offers, thereby annually increasing the number of white cane workers, so as to make good provision for the time when the kanakas leave? This query may be met by the fact that, while ten growers registered for rebate in 1903, since that year four or five growers have gone back to coloured labour, admittedly owing to their being unable to obtain sufficient white labourers to get through with their work with the cane. Another drawback is that the continuation of the bonus is an uncertain thing, and, taking both these causes into consideration, they are effective in inducing growers not to register.

The only remedy that my association can think of is the immigration of agricultural labourers in sufficient numbers to ensure that the cane-harvesting will go on, that the mills will not be idle, and we most earnestly hope that the conference will pass a hearty and unanimous resolution to that effect.

The alternative is the sugar-growing industry passing from the hands of whites into the hands of Chinese.

The Chairman: We have this forenoon a paper by one qualified to write on the subject. It is a paper dealing with climatic conditions, and we may be assured that we shall hear something of deep interest to us. You have got before you in Mr. Swayne's paper a number of figures which are worthy of close study. Had there been any figures in Mr. Waller's paper, I would have supported a suggestion that was made to me, that we defer discussion upon it until all the delegates see it in print. Those of you, however, who followed the paper, must have noted the points that Mr. Waller desired to emphasise. You have also a paper by Mr. Griffin in which he is apprehensive of what may happen if the labour conditions of the North are not modified. The questions raised in the three papers that have been read are most serious ones, and I propose, therefore, that we now adjourn until two o'clock, and would ask those who are going to discuss the papers this afternoon to use the time between this and our reassembling in familiarising themselves with the subject.

The Conference then adjourned for lunch.

SECOND SITTING.

Monday, 15th May, 1905, 2 p.m.

The first business was the reading by Dr. T. F. Macdonald, of the Johnstone River Central Mill Association, Geraldton, of his paper on—

THE CLIMATE OF NORTH QUEENSLAND IN ITS RELATION TO WHITE LABOUR IN TROPICAL AGRICULTURE.

[By Dr. T. F. Macdonald.]

When the Johnstone River Central Mill Association appointed me as their delegate to attend this Queensland Farmers' Agricultural Congress, my appointment was supplemented by the request that I would give my views and experiences of white labour in tropical Queensland. It is not my intention, therefore, to read before you a paper bristling with climatological data. I shall not either bore

you with a long discourse upon anthropology; but, rather, having in mind the fact that I am addressing a body of practical men, accustomed to deal with questions of broad principle and common sense, I will endeavour to dispel the erroneous opinions, false conceptions, and interpretations which hide this grand truth, that: The climate of North Queensland, correctly understood and intelligently handled, is not only the best, but absolutely the very best climate in the whole round world. What has given rise, then, to opinions freely expressed at times in political quarters and in the Southern Press, that here in North Queensland we, the pioneers of an Australian Empire yet to be, are doomed to toil in a tropical hell? An earthly paradise were surely nearer the mark! Let us look at things as they are—not as we imagine they ought to be. In the tropics of Queensland Nature is lavish of everything; and particularly, almost abandonly, lavish of the basic elements of agriculture—land, water, and sunshine! It would almost seem that Nature, fearful of having overdone the thing in sunlight, hastened to correct her error by sending us the wet season in the very height of summer heat. While our brothers south of the tropics are being broiled alive, and those of the Western tablelands are frizzling under the naked sun, we, in the glorious North find the heavens hung with clouds, the air cool with rain, our drains and backyards flushed with floods! If we suffer, it is from having too much of good things.

In the tropics all things grow to luxuriance. Animal and vegetable life alike flourish; from the microbe to the fig-tree, things that live find their happiest environment. Here the natural laws of Biological Evolution can be studied to advantage; you examine everything, as it were through a microscope, on enlarged scale.

In these days of advanced science doubtless an explanation according to strict scientific demands could be found for this exuberance of life. I will content myself with the common observation that, somehow, moist heat and sunlight are the true forces behind tropical growth.

Man himself forms no exception to the tropical rules of development. It is a matter of simple fact that people under otherwise healthy conditions develop in body and mind in the tropics. The very rapid growth of children at first sight appears to be a degeneration rather than an advance; but note the future development of those same tall slim children born of white parents in hot regions. They grow mostly into young giants; and, even as strength comes to the men, so do health and beauty to the women, when a reasonable observance of tropical hygiene obtains in immediate social surroundings.

This brings me to the crux of the whole question of human life in tropical countries. In my experience all races of men, all shades of colour, thrive equally well in North Queensland; and all alike are subject to the one adverse element of the tropics—viz., tropical disease.

It is not the climatic conditions—not the heat, moisture, nor peculiarity of sun rays—that sap the life of men and women and children in tropical countries. The very conditions which favour biological development generally of what we may term useful plants and animals bring into existence also, and cultivate with the usual tropical munificence, the whole breed of parasites, great and small, which lie at the root of tropical disease.

"Just so!" I can imagine some of you thinking, "the diseases of the tropics are so terrible, so trying to women and children, and even to men, that white people should not be asked to work under such conditions!" To which argument I reply: "The coloured races are not immune to tropical diseases any more than the white peoples. Parasites of the worm species are not particular as to the colour of skin; their chief occupation is blood-sucking, mostly from the inner man; and blood of all races has the same colour and chemical composition." I will further contend that many tropical diseases have been introduced to Australia by coloured peoples—leprosy by Chinese, and anchylostomiasis by Arabians, are striking examples.

To such a disease as that of anchylostomiasis there can be no immunity in the true sense of the word. One cannot become immune to the bite of a blood-sucking worm any more than to the kick of a mule. But at the same time, by a clear knowledge of certain diseases, we can conquer them by special efforts of stamping out.

I would here indicate to those likely to settle in the North that very strenuous attention must be given to this aspect of tropical life. I might briefly mention as examples of what to expect in this way:—

(1) Malaria is a disease caused by a parasite of the blood, introduced by a variety of mosquito which only feeds at night.

Prevention is to be found in mosquito nets, universally used; and stamping out of the disease from a country is brought about by the free use of kerosene in all waste-water places and in water-tanks. The larvæ of the mosquitoes are thus destroyed, and, consequently, the parasite, losing its host, dies a natural death.

(2) Anchylostomiasis, or earth-eating disease, which may fairly be called the scourge and curse of North Queensland, is a disease caused by internal leeches which suck blood from the intestinal canal. Existing in millions, they soon make themselves felt by the sufferer becoming pale and weak and lazy; indifferent to life in every shape or form, his one desire is to eat dirt in the first stages, and to commit immoral acts in the second.

The terrible nature of this grave disease must not be underrated. But, I am sorry to say, both the Government of Queensland and its people have made themselves a target for the gibes of the world by their neglect of it—so much so, that England has, for very shame's sake, decided to send out a staff of experts to report upon and study this and other tropical diseases.

It is to Queensland's eternal disgrace that it has continued to allow its public schools to become hotbeds of infection for this disease with all its symptoms of youthful immorality. The very life's blood is being eaten out of the body of young Queensland and morality out of its soul by worms; and the climate of tropical Queensland has to bear the blame.

In Geraldton, where this disease is thoroughly understood by the people, even to the children themselves, organised effort is being made to stamp it out and curtail its ravages.

In so far as tropical disease is mostly parasitic in its nature, it obtains alike its virulence and vulnerability.

Were it not that science can grapple with parasitic diseases, I should be the very first to say to all peoples: Leave the tropics to Nature and her parasites, which here assume titanic proportions; and they are too terrible to face.

It is one thing for science to find out truths valuable to humanity, but it is quite another thing for humanity to accept those truths and to apply them!

For the last six years I have tried to arouse Queensland and Australia to a lively conception of its sufferings from the ravages of anchylostomiasis, and to the further dangers of its spreading into the subtropical and temperate portions of the Commonwealth. Although a tropical disease, wherever artificial tropics obtain, as they do in deep mines, there will the disease be found if its spread from Queensland be not stopped.

I have appealed to the Federal authorities; questions have been asked in the Queensland House relative to my public statements; I have written to the *Brisbane Courier*, and, though my words have been quoted all round the world, nothing has been done by Queensland to either confirm or deny my assertions as to the terrible nature of the disease of which I speak.

However, I know it is only a matter of time to educate public opinion; yet very, very valuable time is being lost now while the disease is marching on its way clothed in immorality and crowned with death.

I have brought a few samples of the parasite which is responsible for earth-eating. Those who are interested enough may see under the microscope the blood-sucking worm and how he feeds. The photograph exhibited shows the last stages of the disease in a child about three years old.

The disease itself is curable, quite easily so, but public help is required to stamp it out.

Colour Question.

It is thought by some, perhaps many, that Chinese and Japanese are better fitted than white people to work in tropical agriculture. This contention I wish to question very seriously. It seems to me that, without any rhyme or reason, people quickly assume that a coloured skin affords protection against the rays of the sun; and that, therefore, coloured-skinned people are those fitted by Nature to do tropical work. By this token their coloured skins are best for extremely cold climates! for the Eskimo is a brown-skinned man! And, again, the aboriginal inhabitants of America and Canada, countries notorious for their cold weather, are red-skinned people!

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The Japanese, who inhabit temperate climates, on the 40th parallel N., are again brown in colour. The Chinese, who barely touch the tropics, are yellow; while New Zealand and Tasmania, a long way out of the tropics to the south, were inhabited originally by very dark races!

Let us look at the matter from a functional or physiological point of view. Why should a dark skin protect the individual from heat when it is a well-known fact that black colour attracts the heat? Let anyone who doubts try the experiment of black or brown boots in the sun; or white *versus* black hat and coat, &c. All experience is in favour of white dress for hot climates.

The origin of coloured skin, or of white either, is still unknown. If the sun is really the active agent in its evolution, the power of sunlight must have been curtailed when people took to wearing clothes. The slightest protection, as seen in the use of ladies' veils, keeps the white skin pure. Therefore, if there is any protection afforded by natural dark skin, an equivalent is obtained for white people by the use of clothes. Until white people begin to discard clothing in the tropics, their skin will remain white.

Sunburn must not be confounded with pigmentation of the skin. Sunburn is merely a tanning of the epidermal cells on the surface of the skin, whereas "pigmentation" is caused by a deposit of dark matter within the deeper layers of the true skin.

Summing the whole evidence up, considering all arguments derived from history, anthropology, ethnology, and general evolution, it seems to me that the coloured skin is an intermediary stage of development between our primate ancestors and the pure white or Caucasian skin. My general contention is that white-skinned peoples are the oldest stocks of humanity, and that in the process of evolution they became white by the use of clothes.

I can imagine how the action of sunlight, allied to other internal physiological changes, gradually produced an atrophy of hair, which led to the hair pigment being slowly driven into the hair roots, and finally deposited there, to be again slowly by ages of solvent action destroyed.

I have touched this colour question at some length, lest any white settlers be kept away from our lovely gardens of Eden from fear of their descendants turning black from the light of the sun!

Johnstone River Central Sugar-mill.

The Johnstone River people are so convinced upon the main opinions I have outlined in the above sketch, that they have a movement on foot to create a local sugar industry worked entirely by white labour.

They have so far formulated the most democratic scheme for working a sugar plantation ever devised. It is the aim of the promoters of the Johnstone River Central Mill to so order things that every worker on the Central Mill lands will be a shareholder in the mill. By their scheme of 10-acre holdings or workers' blocks, a practical step has been taken, which is meeting with ready response from the workers in the district and from many others elsewhere.

It is my intention to lay before the members of the Johnstone River Central Mill Association a scheme for the introduction of gangs of white girls to help in the fruitful work of cane-harvesting, each girl to be a shareholder in the mill. Special arrangements for accommodation, and general protection, and encouragement will be advocated.

So serious a suggestion has not been made without long and deliberate consideration of all sides of the question. Of course objections will pour in; but I know they will come from theoretical, not practical, inspiration.

In every country under the sun but ours, girls and women work in the harvest fields, to the benefit of the workers themselves and to the wellbeing of their country.

The climate of North Queensland will make women of multitudes of girls now growing like social weeds in and around our cities. However trying the canefields may appear, they will be as paradise to the conditions which obtain in the slums and factories of Australian towns. Pure air, hygienic conditions, and a life of hope in the canefields of Queensland will do more to regenerate mankind and womankind in one day than years of theoretical preaching in the cities.

It is sunlight which has given us the mighty scrubs of to-day, as it has in days gone by laid down the seams of coal. It is sunlight which has given us our white skin. It is sunlight which purifies a poisoned earth, makes it wholesome and sweet and good to look upon; and it is the sunlight of North Queensland

which is destined to come to the rescue of the city slums and the unemployed of Australia. It will lend a hand in the development of the human race, and lay its kindly fingers upon many a poisoned social sore.

EUGENICS.

All over the world a movement is on foot for the better breeding of the human race; a new science on the subject—Eugenics—has been created. With happy gangs of men and women in the canefields of Queensland, each member free and prosperous, it needs no philosopher to forecast the result! Brought face to face with the double law of natural and artistic selection, healthy people in a healthy environment; economically prosperous, and ethically free! These are the eugenic conditions which will lead to happy marriages and the rapid evolution of a noble race.

All questions of land settlement will settle themselves; and this hideous nightmare of thousands of miles of unoccupied land in the tropics will give place to the lovelinesses of agricultural civilisation.

Innumerable waterfalls and cascades in the tropical belt of North Queensland flow on unused, almost unheard; millions of acres of fat tropical alluvial land await the axe and plough. Who shall inherit this treasure trove, east or west? What shall the colour of the inhabitants of these regions be some 100 years hence? In the struggle for existence shall the white or coloured peoples survive? These and such like questions should be in the minds of all who dream of dwelling with us.

Here, on the most distant frontier of the British Empire, questions are growing which may ultimately have to be settled by appeal to arms.

Speaking as one who believes in his own race—yet who can fraternally and gladly extend the hand of welcome to all peoples—I feel it my duty to warn Australia that, if it means to maintain its policy of white colour, now is the time to be building up those institutions which will be necessary to defend this portion of the country against all-comers.

A white population in the tropics can be the only safeguard against encroachment of Eastern peoples. That population, too, must be one of activity and grit.

The fathers and mothers of the future peasantry of North Queensland must identify themselves with the great sugar industry to begin with; and I can think of no happier plan to develop the proper material than that of girls in the canefields to lend a necessary hand in work, and to prepare themselves for future destiny.

By this means acclimatisation of white peoples can be brought about, if the present stamina of the race is not fit for the task of populating a tropical country.

Experience of the last two years has proved that young white men can stand the work and climatic conditions of cane-harvesting.

Speaking from my own personal experience of the white gangs of cane-cutters on the Johnstone River, I can testify to the fact that they flourished in health while at the work. One man, indeed, who came down from the tableland a wreck from influenza, regained his health and strength while working in one of the gangs.

Some of the farmers' daughters on the Johnstone River develop a taste for work in the canefields, and enjoy themselves as much as the girls in the harvest-fields at home.

Much more might be said on this subject, but I fear I have trespassed upon your valuable time already too much; and so I will conclude with the hearty wish that this Queensland Farmers' Congress, in the very heart of the tropical belt, will lay the foundation stone of a great white Australian nationality.

And may the day come when, even in this city where we meet to-day, the farmers of the world will meet in an international agricultural congress; and may they return to their several countries loaded with the spoils and fruits of practical work and theoretical principles evolved and practised here.

The CHAIRMAN: The subject of this earth-eating disease that has been introduced by Dr. Macdonald is a big problem, and one that will have to be tackled without delay. If these bloodsuckers are to be found in millions, and if our schools are contaminated by them, then, as parents and as citizens, we want to be aware of it. I suppose all of you have heard of this earth-eating disease, and have seen articles on it in the *Brisbane Courier*. Personally, however, I thought it was some sort of abnormal disease or depraved appetite

to which a few children were liable; but, according to the Doctor, not only young children, but also adults can easily contract the disease. Adults do not resort to eating dirt, because they have too much sense, but they take to other things, and before you look at the slides, which Dr. Macdonald has here for your inspection, I would like that gentlemen to say something of what he told me yesterday regarding these blood-sucking leeches.

Dr. Macdonald: The earth-eating disease you have all heard about is caused by a worm which sucks the blood from the intestinal canal. It leaves eggs by the million, and these eggs pass through the stools. They are ground into dust and blow back again on to food, by which means they are taken in by other children. This continual sucking of the blood causes a state of anæmia, or want of blood, in the person affected. It is mostly seen in children, but grown up people are by no means exempt. The child takes in the egg, which grows into a worm. The child becomes pale and listless, and gradually gets into the condition of the photograph I now show you. That is an extreme example of what ultimately results with the child. The child becomes so wasted that dropsy sets in and death ensues. I tapped this particular child and drew off about a gallon of water, and it is now quite better. In the schools they become infected, and not only a few children, but all the children in a school become affected. They take the disease home to the farms, with the result that the parents contract it, and by this means the disease is spread all over the country. The worst part of the whole thing, next to the physical degeneration, is that there is a peculiar evolution of immorality developed. The child when very young begins to eat dirt, and the parents forbid it to do so. The child's appetite overcomes its obedience and that is the first element that makes the child immoral. Then the parent punishes the child for the habit, with the result that the child lies about it. Stealing dirt is the next stage. These are evolutionary stages—disobedience, lying, stealing, and the next stage is, unfortunately, immorality. I am reading a paper on the subject next September, and will not go further into these points. But, if I could convince you of the existence of this worm in almost every coastal town from North to South, I will be satisfied for the present. After my first letter on the subject to the *Brisbane Courier*, letters poured in on me from all over Australia, and I feel sure that if I could get a commission from the Federal Parliament that I could trace, from the letters I received, the disease all along the coast of Australia from here to Perth.

Mr. D. Pearson (Ingham): I would like to move the following resolution, and, in doing so, may state that I can vouch for a good deal of what Dr. Macdonald has said—"That in the opinion of this Conference the question of Anchylostomiasis, or earth-eating disease, demands immediate attention on the part of the Queensland Government, and that our Chairman, the Hon. D. F. Denham, M.L.A., be requested to bring the matter before the Cabinet at an early date."

Mr. L. J. Moody (Geraldton): In seconding the resolution, I may say that I have frequently seen cases of adults, as well as of children, being affected by the disease, and have also seen the successful results of Dr. Macdonald's treatment of it. I have seen the worm in large quantities, and, although I cannot deal with the subject from a scientific aspect, I certainly think it is the duty of this Conference to take whatever steps it possibly can that will tend to combat the disease.

Mr. Deacon: Does the disease go far down the coast?

Dr. Macdonald: Round to Perth in Western Australia.

The Chairman: I understand it is by no means confined to Australia. I believe it is very much in evidence in the mines in Cornwall. Wherever there is a temperature warm enough for it, it can develop, and the whole of the Australian belt comes under that heading. The so-called Queensland fruit fly is by

no means our monoply, and I hope that it will not go forth to the public of Australia that we have this worm all on our own. But, if we have it in our midst, it is well to face it. It is satisfactory to note that the Doctor tells us it can be combated and stamped out. As there are none of us competent to discuss the matter, I think time will be saved by dealing with the resolution, and, if it is carried, it will be my duty and pleasure to place it before the authorities as desired in the resolution.

Dr. MACDONALD: I would like to point out that I made an application to the Federal Government for support, and that the Prime Minister was greatly impressed with the gravity of the situation. He brought it before his Cabinet, and the answer was that they were very much in sympathy with my proposals, but that they were afraid they would be infringing on State rights by interfering in the matter.

Mr. W. DEACON (Allora) thought the State Government should deal with the matter.

Mr. J. G. FEARNLEY (Cairns): I have listened to those who have spoken on the subject, and think that if we invite public attention to the matter we will be inviting further trouble in our commercial transactions. You will remember that some years ago the Queensland banana was interfering with the southern fruitgrower. Immediately we became possessed of the Queensland fruit fly. Then we had plague. The endless restrictions and humbug that have been inflicted on Queensland when plague has been stamped out and yet remains in other States, only those in business can realise. It appears, judging from the action of the authorities in the southern States, that the plague travelled in Queensland steamers only. The fruit fly and the plague have been used as weapons by the southern fruitgrower to keep out Queensland fruit from the Sydney and Melbourne markets, and if we are not now careful we shall create another scare that will come back on us rather heavily.

Mr. R. S. AIKEN (Gooburrum): Seeing Dr. Macdonald is going to read a paper on this matter before a scientific gathering, it would be advisable for us, as common farmers, simply to leave the matter in his hands. We are pleased to hear what Dr. Macdonald has to say. But, being only common farmers, I think we should leave it to the medical congress; and if they, in their wisdom, agree with Dr. Macdonald, then let them place the matter before the Federal Parliament.

Mr. A. W. CAMERON (Maryborough): The whole of the State is interested in this disease, and the stoppage of its spreading is of great importance. I think that of all the plagues that we in Queensland and in Australia generally have been liable to, had steps been taken at the beginning to stamp them out, such stamping out could have been effected at very little cost. If we allow a disease to spread, it will rapidly assume proportions rendering stamping out an almost impossible task, and on that account I certainly agree with the resolution.

Mr. W. G. WINNETT (Beenleigh): I think, as farmers here, and men of common sense and men of humanity, that we ought to support the resolution.

Mr. C. F. M. FISCHER (Zillmere): It gave me an immense amount of pleasure to listen to the able paper that was read by the doctor. I am very much interested in my own private health, and do not think, when we are brought face to face with a matter of this kind, that threatens to become so serious, that we should allow any fear of pecuniary loss to debar us from taking measures, so far as they come within our scope, for the prevention of the spreading of such a scourge as has been described in the paper. In any event I do not think we shall bring much trouble upon the State by passing the resolution, and I am sure that, in the hands of him to whom we shall commit it, the resolution will receive the utmost care. The doctor's paper generally, I may say, has confirmed many of my own private convictions on the subject of health. I have never been up so far North as this before, but I always held

that I could live here and do the same amount of work as anyone else. It seems that the disease arises not so much from climatic conditions as from faults of our own, in the matters of diet, &c. I believe if we adopted a rational diet, and adapted ourselves to the conditions of the climate, that we would not lay ourselves open to attacks of this kind. I have much pleasure in supporting the resolution.

The CHAIRMAN: I know very well what an immense amount of capital has been made in the southern papers about dengue, and I believe it is going to have a bad effect on the number of visitors that will come to North Queensland. That rests largely with the Press, but I feel assured that those of the Press who are here to-day will do nothing in the direction of making a scare. If the resolution is passed, it will be submitted to the right quarter, and possibly something may come out of it.

The resolution was then carried.

In the absence of Mr. C. E. Jodrell, who was set down for a paper on this subject, Mr. J. C. Brünnich, the Agricultural Chemist to the Department of Agriculture, delivered the following remarks on—

VARIETIES OF CANE, AND EXPERIMENTS THEREWITH.

Mr. J. C. BRUNNICH: Individual experiments, which can be carried out by a small grower, are no doubt to be encouraged, but still all these experiments ought to be under some scientific direction, in order to avoid expense and delay, besides ensuring the getting of results on a true scientific basis. For this reason if anyone does carry out experiments he ought to be "*en rapport*" with the Director of Sugar Experiment Stations, and try and get the proper instructions as how to make such experiments most valuable. In selecting cane varieties for different localities, a great many points are to be considered, and I may mention those which are of greatest importance. The first is the quality of the cane, with regard to amount of cane sugar and purity of juice. For instance, you might have a cane fairly high in cane sugar, but its impurities are so high that the working of the juice becomes very difficult to the mill. The second point is the time or season of maturity of the cane. The miller is always on the lookout to start the crushing as early as possible, and it is, therefore, desirable to have an early maturing cane and one that reaches its top quality at the earliest part of the year, and also maintains its good quality for a long period. The third point are the yields per acre of the plant and ratoon crops. Many a cane gives a fine plant crop, but a poor return from the ratoons. Unlike Java, where they replant every year, a good ratoon yield is of high importance with us. Then there is liability to arrow. Some varieties are very liable to arrow. Once a cane arrows, its growth comes to an end; and arrowing is, therefore, a disadvantage. It is true that arrowing is a sign of ripeness.

Of great importance is the thrashing of the cane, and, therefore, the experimenter with varieties looks for a cane from which the trash is easily removed. In some varieties the trash drops off of itself, but improvements in this direction could yet be effected. Of further importance is the habit of growth of a crop, with regard to the form and straightness of its stalks. Some canes have a habit of creeping along the ground, and then growing in an upward direction. This means difficulties in cutting, and also in the loading of cane on the trucks. With straight cane you might get 2 tons on to a truck, but with a crooked variety it might be difficult to load 1 ton on to the same truck. The difficulties of harvesting are also much enhanced when crooked canes have to be dealt with. The root system of the cane is another important point. Many canes are what are called deep rooters, others shallow rooters. A deep rooter has naturally a greater amount of soil to work upon, and is better able to withstand winds and cyclones than a shallow rooter. The root system is again of importance in the matter of grubs. A good rooting cane resists the attacks of grubs, and will recover from their attacks much sooner than a

shallow rooting cane. To the habit of the cane belongs the formation of the joints and the eyes. Some canes have prominent eyes, while others have the eyes strongly adherent to the cane and much smaller in size. This latter point is of importance when cane plants are being cut. If the eyes are sticking out they are easily knocked off, and a large percentage of the plants becomes useless. Small-eyed canes are, therefore, preferable.

Another point is freedom from disease and the ability of the cane to resist the attacks of diseases, grubs, and borers. We know that certain varieties recover very rapidly from grubs if they get a slight shower of rain. Daniel Dupont will easily recover, but Rose Bamboo, if it is once severely attacked by grubs, will never recover properly.

Milling Qualities.—Some canes are soft and easily milled, while others again are hard and difficult to mill. A Honolulu variety is so easy to mill that the megass contains very much less cane sugar than the megass from Rose Bamboo. You will find from the returns of the Fiji mills that they get better returns than we do on account of their growing varieties easier to mill than the varieties common in Queensland. A very large number of cane varieties have been analysed at the Mackay Sugar Experiment Station, and the report of the Bureau of Sugar Experiment Stations shows the great differences in sugar content exhibited by the several varieties tested. In last year's crop the cane with the lowest yield of sugar was a New Guinea variety, with 7 per cent., whereas the best canes contained 20 per cent of sugar. This means that, while at least 15 tons of the former are required to get 1 ton of sugar, 5 tons of the latter are sufficient. Then as to yield; in the Crop Results of Varieties for 1904 it will be found that one variety yielded at the rate of a third of a ton per acre only, while the best yielded at the rate of 11 tons of sugar per acre. Between these extremities you will find a great number of canes, and the Director picked out ten of the varieties which he thinks most promising for the Mackay district. It should always be remembered that a cane which is suitable for one district is not necessarily suited to another district, and it is of great importance that varieties should be tested in more than one locality. In this respect individual experimenters will be of great help to the Sugar Experiment Station. It is very pleasing to note that of all the canes which have so far given the best results, and which bid fair to become successors to the Rose Bamboo, are some of the New Guinea varieties which have been imported through the aid of the Department of Agriculture and Stock. It was due to the efforts of the then manager of the Kamerunga State Nursery, the late Mr. Ebenezer Cowley, and the present Government Entomologist, Mr. Henry Tryon, that the New Guinea canes were introduced.

The Chairman: I think we have had something placed before us by Mr. Brünnich in a concrete form. If you get hold of a cattle-man, he can dilate upon the points of a beast from the horns to the tip of the tail, but there are evidently almost equally as many points to be found in a stick of sugar-cane, and Mr. Brünnich has, in a very terse way, brought these points before us. In my estimation Mr. Brünnich has indicated one way in which the labour difficulty may be combated. We want a cane that is easily trashed, a good yielder, and one that is a good resister of disease. By getting the ideal cane that has been outlined by Mr. Brünnich, we may be able to overcome the labour difficulty that is now looking the cane-grower of North Queensland in the face. The scientist is doing good work, and I do not despair that he will be able to help the cane-grower in the direction that I have indicated. We know quite recently that we have been amazed at rumours that have reached us of the doings of Mr. Burbank. The things that he has done seem incredible. Plums in the Mexico district were so liable to frost that they could not be produced, but Burbank has evolved a plum that is absolutely impervious to frost. Frost may come upon the plum when in flower, and yet the latter will eventually fruit. That is the result of plant-breeding and scientific investigation. We have been told that he has given to the world an edible fruit from

the cactus. He has taken away the spines, and given us the cactus in a new form, which yields, besides the fruit, leaves which can be made into a kind of preserve. I have great hopes that in the matter of improvement in varieties many of the minor problems confronting the sugar industry will be solved.

Mr. E. Swayne (Mackay): There is one point that was not referred to by Mr. Brünnich, and that was the matter of disease. That is a line on which your Department, Mr. Chairman, might do a little more work; and I might say that in my district it is rather a big question. We have gumming disease and another disease—reversion, which is becoming very serious. Last year I lost £10 per acre through the latter disease. There is a cane called the White Bamboo, which has done very well in the Mackay district. I had a very good plant crop, but the first ratoon crop, instead of going 40 tons to the acre, only went 20 tons. If it had not been for this reversion, the return would not have been so low. Briefly, the outward symptom of the disease is that the cane turns colour, the White Bamboo becoming pink. The cane cracks, and, the moment the disease appears, all growth in the cane ceases. It may come in after Christmas, and, if so, you will get no further increase to your crop. As already stated, we are also troubled by the gum. We have had canes that have been most promising, and I might instance the Chenoma. Although some growers were getting high prices for Chenoma, yet nobody is now planting that variety, owing to its liability to gum. On scrub land we expect the cane to last five or six years, so, if you have not a good ratooning variety, you will lose. We thought the Malabar a particularly healthy variety, but it is now beginning to show reversion; and this remark applies to many of the old standard varieties of cane. The best canes in the Mackay district at present are the New Guinea varieties; but the question is, How long will they remain disease-proof? It seems to me that it is a matter the Department might take up.

Mr. E. Hicks (Nerang): The best cane down South is the Striped Singapore, a cane that has been tried alongside all others, and is still going ahead. But from Bundaberg northward it has too great a tendency to arrow, although down about Nerang it gives us no trouble in that direction. If it were not for the Striped Singapore, the sugar industry down our way would have disappeared long ago. We have tried the New Guinea varieties. They seem to do well for a year or two, but then they seem to get diseased. Across the border in New South Wales, the Colonial Sugar Refining Company will only let them plant the Malabar, a cane that down there is free from disease. It is a deep-rooting cane, and one that stands storms well. Moreover, it is practically the only cane that can be said to trash itself. It stands up well, but is a very hard cane. It suits the Southern climate, but I am doubtful if it would do equally well up here.

Mr. T. Ryan, of the Mossman, stated that on the Mossman they used the Striped Singapore and the Rose Bamboo, and found that they did all right.

Mr. D. Pearson, of Ingham, in response to a question, stated that the Badila and Goru (New Guinea varieties) did very well in the Herbert district.

Mr. W. Griffin (Cairns): In the Cairns district we have been growing the Rappoe on a general scale, and have also been using the Striped Singapore. We have also Meera, Chenoma, and Daniel Dupont. Now, we are superseding all those by planting the Goru and the Badila. The Goru is a heavy cropper, and the mills are encouraging the farmers to grow it. The Badila does not suit the farmer so well, because it does not produce so heavy a crop. The Rappoe is an old favourite, but it seems weak as a grub-resister. The grubs, in fact, worry the life out of it. Many of the gentlemen who went out to the Mulgrave on Sunday saw the ravages of the grubs, and I may say that they were mostly on Rappoe cane. It is a rich cane, but not quite so rich as the

Goru, and not so strong a ripener. With us, at the present time, the Goru is the first favourite. The mills do not like the Malabar, as it is hard to crush and is not particularly rich in sugar. It is not a nice cane to trash. There is, however, nothing difficult in it, although up here, at any rate, it is not a self-trashing cane. We have a self-trashing cane—the Batoe—but it is not a nice cane to grow.

Mr. E. S. Waller (Herbert River): Our principal canes have been the Rappoe and Meera, but during the last five or six years a disease has come in which we call rot, and which has made a very great difference to our crops of cane. It generally comes after the first heavy rains, when the sun comes out very hot. We made inquiries from Mr. Tryon when he came up to investigate the matter, but we could not find the cause of it. The conclusion, however, that I have come to, and some of my neighbours have the same opinion, is, that the cane has degenerated through having been planted from the same plants too often on the same land. Our new plantations have accordingly been planted with cane from other parts, and, for the present at any rate, we do not see so much of the disease. Just as the wheat-grower finds it necessary to get his seed from some other place than his own immediate locality, so will the cane-grower, to preserve the health of his fields, have to send out of his own district for his plants. This year I have noticed my crop and my neighbour's crops of Rappoe and Meera have not got this disease, but the climatic conditions have been more favourable, so far, than usual. We have not had such a deluge of rain, but for all that I am inclined to attribute the comparative immunity to disease to the change of seed that we have gone in for. Another trouble is the gum, and that is a trouble that affects the mill, perhaps, rather more than the grower. The presence of gum affects the return of sugar very much, so much so that the Colonial Sugar Refining Company are doing all they can to prevent the farmers from using plants from gum-affected cane. That is one of the reasons why we found it necessary to go afield for plants. I cannot agree that the Rappoe is inferior to the Goru. I cannot see that you can beat the Rappoe, or Rose Bamboo, as some call it. It is our best cane all round, and I think it is still the best. The Goru is a very nice cane, but I do not think it will beat the Rappoe. The Goru has one of the faults mentioned by Mr. Brünnich, and that is, it has an inclination to grow down after commencing to grow, and then come up again, with the result that you have crooked sticks. It is thereby a difficult cane to harvest and to load into the trucks. It seems, however, to be a healthy cane, and in the Cairns district it seems to be one of the best. But, from my own personal experience, I will stand by the Rappoe, for I have found it the best all-round cane, provided you give it good cultivation and change the seed occasionally.

Mr. J. C. Brunnich: The remarks made by some of the planters who have spoken show distinctly that my qualifications for a good variety are borne out, but I may say that to state that a cane is a good variety is not the conclusion of the subject. It is of no use being satisfied with a cane because it is a good one; but what you want to do is to try and get a better. The peculiarity of cane is that you always use a small cutting of the plant to propagate the new plant, and thereby many characteristics and faults are more easily transmitted than if you propagated by seed. For this reason, the selection of plants is very important. Striped Singapore and Rose Bamboo are good canes, but yet in the Mackay experiments they only yielded 3 tons of sugar per acre, against 11 tons per acre yielded by another variety. Rose Bamboo, however, is an almost ideal cane, and one of its best points is that it keeps its quality for a long time. The chief fault of the Malabar is that its quality goes off very rapidly. You have to cut it in the nick of time, and it is very hard to crush. A grower should not be satisfied with one variety, for it is not at all unlikely that that variety may suddenly become liable to a disease. For instance,

at the present time in the Mackay district, the Rose Bamboo is beginning to show disease more than any other kind. In view of this, growers should always be on the lookout for new varieties to replace the ones that are dying out.

THE CONTINUATION OF THE SUGAR BONUS.

Mr. R. S. Aiken (Council of Agriculture, Bundaberg): In introducing this subject of the bonus, at the outset I wish it to be clearly understood that, in no sense of the word, have I any desire to enter into a controversy whether cane be grown by white labour or not, and I hope subsequent speakers will adopt the same policy. The law at the present time is, that the bonus will expire at the end of 1906. That is the bald fact. This bonus, as you are aware, is paid, in the first instance, by the manufacturer—that is to say, there is an excise duty of £3 a ton on all sugar manufactured; £2 of that is supposed to be repaid to the cane-grower in the shape of a bonus; £1 is retained by the Federal Treasurer for the purpose of paying the cost of administration. Last year there were 145,000 tons of sugar manufactured in Queensland, which yielded an excise of £435,000. £85,000 was refunded in bonuses, leaving a balance retained by the Federal Treasurer of £350,000. I maintain this: That either the excise duty should be lowered or else the whole of that £435,000 should be paid to the cane-growers in increased bonus. We had to pay at the rate of 6s. a ton on our cane towards the bonus, and we get 4s. 4d. returned. North of Mackay it is 5s. South of Bundaberg we get 4s. While we pay 6s., we get 4s. 4d. returned. I think the whole of the money that is paid in excise should be repaid to the growers of cane, or the excise should be lowered from £3 a ton to £1 or £2, as the case may be. This money, which is retained by the Federal Treasurer, is divided among the State Treasurers according to population, under the assumption that the consumer finds this £435,000; but I do not agree with that. It may strike the consumer that he does find it; but, in the event of the industry being snuffed out, is there anything to show that the consumers will be able to obtain their sugar at a lesser price than they now pay for it? The maintenance of the sugar industry is, in fact, the only safeguard that the consumer has that he will get his sugar as cheaply as he gets it now. There are a number of resolutions coming before this Conference which will enable me to have another say, but I would like to say now that I sincerely hope that the resolution for the extension of the bonus will be carried unanimously by this Conference, more particularly when we have heard that in Melbourne a gentleman of the name of Peacock is advocating the abolition of the bonus. He is preaching to the fruit-growers of Victoria that if the bonus is done away with he will be able to give the fruit-growers a higher price for their fruit. Is this the spirit we expected when we entered upon Federation? Here we have a man advocating the killing of an industry in Queensland which is one of the principal industries of the whole Commonwealth. We have this man endeavouring to destroy this industry, in order to build up the fruit industry of Victoria. He forgets we are large consumers of the article which he makes. I sincerely hope that we will pass this bonus question because, in its wisdom, the Federal Parliament has expressed a willingness to pay a price for a White Australia. To be consistent, when the bonus expires in 1906 let our rulers re-enact it, and act as men to those who were induced to enter into the Federal Union. In this connection I have also been desired to bring up the matter of the unrestricted registration for cane grown by white labour. At the present time, if the cane farmer has planted his cane with black labour, and wishes to sell or lease that land, the lessee or the buyer of that particular land would not be able to claim the bonus, simply because the cane was planted with black labour. I take it, if we want this white-labour policy to be a success, that we should open the door as widely as possible, so that every man who desires to grow cane by white labour may do so. At the present time many of the restrictions regarding the bonus hinder a man from employing white labour. If cane had been planted by black labour, and it was only a plant cane crop, then the owner would require to plough it out, and replant

by white labour before he could claim the bonus. The Bundaberg Council of Agriculture will be very pleased if this Conference will carry a partial resolution asking the Federal authorities to extend the bonus. Since the Council addressed the Department of Agriculture, it has ascertained that, although the Act says the mill-owner must pay down in cash, according to the size of the mill, a monetary guarantee, the Administrator has not insisted on such payment—that is to say, supposing a mill-owner can produce two securities to the satisfaction of the Customs authorities, he has not to deposit any money. I have heard, moreover, that, with one exception, none of the mills in Queensland have to make any cash deposits. Therefore, it is not necessary for us to move in the part of the resolution dealing with this subject which appears on the agenda-paper. Again, without expressing any opinion as to whether cane can be grown or not in Queensland with white labour, I sincerely hope that the matter of the extension of the bonus, and the removal of the restrictions to which I have alluded, will be passed unanimously by this Conference..

Mr. E. Swayne (Mackay): I desire to move—"That, in view of the feeling of great doubt and unrest which exists as to the continuance of the bounty, the Federal Government be requested to introduce at once a Bill to extend the provisions of the *Sugar Bounty Act of* 1903 for a further period of ten years at least." Mr. Aiken has spoken fully on the subject of the bonus, but I may point out, in addition, that this bounty, which was given us as a partial recompense for the labour taken away, does not really meet the increased cost of production. The resolution, therefore, contains no extravagant request.

Mr. Aiken seconded the resolution.

Mr. W. Griffin (Cairns): I may say that the Cairns farmers view this question with great concern; in fact, they look upon the bonus as absolutely necessary. It is essential for the keeping of the white farmers on the land, and for getting others to go there. We feel that without this bonus the present great area of land that is farmed by aliens will be immensely increased. We are losing the labour to which we have been accustomed in the past, and the bonus is the one thing necesary to enable us to make an effort to carry on under the changed conditions.

Mr. A. W. Cameron (Maryborough): The sugar industry in our district, and I believe in the whole of Queensland, is practically at a standstill. We are getting good crops, but there are no new areas being put under cane, for the simple reason that we do not know where we are, and, unless we get the bonus extended for some certain time, it is not likely that any person will put any money into the industry, and make it a progressive industry again.

Mr. Deacon (Allora): How long?

Mr. Cameron: Ten years. I should not ask for one year less. If we do not want to see this industry going back, we must place it on such a basis that people will not be afraid to put their money into it, and extend their operations. At the present time the areas are not being extended, and I am satisfied that no one will put an extra acre under cane until this bonus question is settled. We do not know yet what the effect will be when the kanaka is withdrawn. That the white man can grow cane against the kanaka, I am satisfied; but I am also satisfied that the continuance of the bonus is essential to the progress of the industry, and that it must be assured for a considerable and definite time.

Mr. G. A. Ball (Killarney): I quite agree with Mr. Cameron, and it is very necessary that we should ask for a definite time—say, ten years, at least. The financial aspect of the question must be looked at, and I happen to know that already a number of farmers propose approaching you, Mr. Chairman, on the subject of the erection of a central mill for them. As a reasonable business man, however, I do not think you will invest the funds of the Queensland Government in a venture which may only have a life of two or three years. If

you put your money out, you will want a reasonable security, and I do not think this Conference would be asking a day too long if it asked for an extension of the bonus for another ten years.

Mr. T. Ryan, of the Mossman, in a few well-chosen words, supported the extension of the bonus.

The Chairman: It is absolutely a fair thing that the bonus should be continued, and it is hard that we should have to go, cap in hand, and ask for its continuance when its discontinuance should never have been contemplated. But do not think, however, that you have got your hands on it, for the bonus is not there yet. The very fact of the Federal Cabinet not bringing forward a resolution last session is rather significant. Now, it is important that the sugar-growers should declare with no uncertain voice that they must have the bonus for the ten years. We have not very far to go from our coasts to find competitors, in the shape of hordes of men, in Java, growing cane. You will shortly have amongst you members of the Commonwealth Parliament, and you should let them understand that Queensland is absolutely insistent that fair play shall be dealt out to her with respect to this bonus. Some in the South are complaining about the amount that is kept out of the excise, which they have to pay towards the bonus. They forget we are amongst the biggest consumers of their manufactures, and that, if they in the South pay a little towards the bonus, for every 10s. they pay they receive £1 in return. It is monstrous that the discontinuance of the bonus should be contemplated. Facts are stubborn things, but here are a few figures that have been signed by the Collector of Customs. They are not absolutely definite, but are accurate enough for all practical purposes. In spite of the bonus of 5s. per ton that is paid to the producers of white-grown cane in the No. 1 sugar district (which consists of Port Douglas, Cairns, Geraldton, Dungeness, &c.), the quantity of white-grown sugar produced in that district for 1904 was only 3,950 tons, against 49,209 tons produced by coloured labour. The returns for 1904, moreover, show a decrease on those for 1903, the return of white-grown sugar for the latter year being 4,741 tons, or 800 tons more than was produced by white labour in 1904. And this decrease for 1904 is the more striking in view of the fact that the number of white growers who registered for the bonus in the No. 1 district was eighty-seven for 1904, against sixty-eight for 1903. It is absolutely vital that the bonus should be continued, and I hope you will not talk about a five-years' extension. It seems that the reason why the matter was not brought forward last year was political exigencies, and it is a crying shame that a great industry like sugar should be made the plaything of political exigencies. If Australia wants to cary on the big experiment of white labour for tropical agriculture, and that is the law, then surely it is only a fair thing that Australia should pay for it. Nothing will afford me more pleasure than to put to this meeting the resolution that has been moved.

The resolution was then carried unanimously.

Mr. E. Swayne (Mackay): Before moving the next resolution, I desire to thank the Chairman for the hearty way he has supported the first. The next motion entrusted to my charge is—"That, in the opinion of this Conference, the extent of the industry and its prospective development require that the *Pacific Island Labourers Act* 1901 be rescinded, so as to provide for the continuance of the number of Pacific Island labourers now employed in the industry." I may say our reason for moving in this matter is that the time granted us for a trial of white labour is not sufficient. In 1902 we got our first bonus, and we have only two years yet to go, and the figures that have been published show that there is not sufficient cane grown under the system to keep one mill going. Up to the 28th February they allowed cane to come in that had been planted by coloured labour, so that you will realise that only a fraction of the cane produced in the State has been grown under the new system. This resolution has already been well considered by the farmers in the sugar districts.

In Townsville, in October last, there was a large conference of Northern growers, and the resolution was passed there. The Bundaberg people are particularly in accord with us, and I may say it is the universal request from the whole of the sugar industry of Queensland. We have not mentioned any time. We leave that in your hands, and trust you will give this resolution the same hearty support you rendered the last.

Mr. H. Heinemann, of Redland Bay, seconded the resolution.

Mr. W. Deacon (Allora): This is one of the matters on which we can all give our opinions. The Downs people have no objection to the kanaka, but they do object to the Chinaman and the Jap. It appears to me, from my own observation, that if we take away the kanaka the whole of the North will fall into the hands of the Chinese, and it seems strange that, in deciding to deport anybody, the powers did not decide on deporting the Chinaman.

Voice: Not game.

Mr. Deacon: After all, it does seem paltry to dump these black gentlemen, with their white collars and cuffs, whom we saw yesterday, on some island in the South Seas, to be clubbed on the head, as that poor fellow was the other day. We had a delightful paper from Dr. Macdonald. It was an artistic and beautiful paper in every way, but I do not believe in getting those slum girls into the fields. In the first place, you would never get the slum girls to go. I think we ought to be past putting female labour into the field to do farm work of any kind. I believe, however, in creating 10-acre selections for working men. It would be one of the things that would solve this labour question in the sugar districts quicker than anything. This same matter was brought forward by the Pioneer River Farmers' Association some years ago, but it was treated rather lightly. However, a similar system has been a success on many parts of the Downs. In conclusion, I beg leave to give my hearty support to the resolution.

Mr. Heinemann, of Redland Bay, thought it would be a shame to deport kanakas who had been living here for some time; and he considered that if, in 1906, all the alien labour in the State was done away with, there would be practically no labour left to work the sugar industry.

Mr. A. Rickert (Allora): I have listened very patiently to this sugar industry question, and from what I learned yesterday and to-day I thoroughly agree with what has been said with reference to the kanaka, and of the necessity for the continuance of his labour in the State for some further time. It would be far better for the North of Queensland, and for the South as well, if the available kanakas in the South Seas were imported here, instead of those at present in the State being exported. They are a harmless people, and they are controllable; and, so far as I have ever been able to ascertain, there is no objection in the South of Queensland to the kanaka. I may say, however, that we are against the other aliens who are forcing their way into the country. I shall have pleasure in supporting the resolution.

Mr. A. J. Draper (Cairns): In contributing my support to the resolution, I may preface my remarks by alluding to the pleasing feature that, so far, most of the support has come from delegates from the Southern portion of the State. It speaks well for the soundness of our case when those who are looking on (and it is an old truism that those who are looking on see most of the game) are in our favour. It is evident to me that those who find in us a market for their produce consider, rightly, that it is to their interest to take a keen interest in our welfare. That is a point that, I think, we may congratulate ourselves on. I am sorry to say, however, that I have heard to-day a fellow Northerner who advocates that, instead of the kanaka, we should place our girls in our canefields. It is all very well for my learned friend to talk of this Northern Paradise. His words were that this is the best country in the wide world, and that its only fault is that it has too many good things. He tells us, moreover, that we should place our girls in the canefields; and

he, a sane man, tells this to sane men. I have six daughters, and resent to the utmost the slur which the doctor seeks to cast upon the women of North Queensland by getting up here, at a representative meeting of the farmers of Queensland, and proposing that in this tropical North we shall place our girls in the canefields to take the place of Chinamen, kanakas, and Japs. It is extremely to be regretted that a conference of men should be humbled to such a level as to have to listen to such words as they had heard to-day. I say that I do not take him seriously. I believe he is a clever man, and a first-class fellow personally; but, like a lot of other clever men, he has got a kink, and is a bit of a crank. It is unnecessary to say anything further about placing Queensland girls in the canefields, but God forbid that an ounce of sugar should be grown in Queensland if it has to be grown by our daughters. No one realises more than I do the importance of the sugar industry to North Queensland, but I very much regret that we have a doctor in Queensland who would advocate putting girls to the field work. It is sincerely to be deplored that such utterances should fall at this Conference. With regard to the continuation of the kanaka, let me say that, without the assistance of the alien, there will be no cane to be cultivated and milled by a White Australia. My hope and wish is that we shall be able to do without aliens of every description, but we have got to take the facts as we find them, and we know very well that from the labour of those men Queensland is drawing a large and annual bonus. The money which those aliens earned is multiplied for the benefit of the Europeans connected with the sugar industry, either directly or indirectly. A point I wish to convey to you is one that is well known to the sugar-men here, and that is, in a given district, unless you can produce a given quantity of cane, it is impossible for cane culture to prosper in that particular district. Let me refer you to my fellow cane-farmers, and ask them why in certain districts only 13s. and 14s. a ton is paid for cane, while we here get 18s. and 19s. a ton. Their answer, of course, will be that, if you supply a mill with its full complement of cane, it is child's play to pay a living price for cane. The tendency is for the coloured labour to drift North. I am not blind to the fact that 27 per cent. of our cane last year was produced by white labour, and I am not blind to the fact that those responsible for the movement are congratulating themselves on the results of their efforts. But they should remember that time alone can work the change they desire, and I hold that, if the same number of kanakas that are now here are kept in the State, that in itself will assist very materially to bring us nearer to that ideal to which every advocate of a White Australia hopes we shall advance.

Mr. G. A. BALL (Killarney): I think the request for an extension of the period during which kanakas may be employed here a very reasonable one, and one that fits in side by side with the previous resolution. It is claimed by the people who are trying to bring about a White Australia that the bonus will work the oracle. If it will, then they should leave the labour question alone. From the figures read out, there are 87 growers who cultivated 3,900 acres of cane, which worked out at an average of about 46 acres per man.

Mr. B. T. MCKAY, of Maryborough, had an idea that all great measures were brought about by evolution, and believed that if the kanakas were allowed to "die out," rather than that they be turned out, the object aimed at in the White Australia policy would be arrived at.

Mr. A. W. CAMERON (Maryborough) thought that the request that the kanaka should be allowed to remove himself gradually was a most reasonable one. The kanaka was not very anxious to leave Queensland, except in a few cases. When a kanaka did get back to his island, he was usually desirous, after a short time, of returning to Queensland. Still, for all that, the kanaka will gradually leave the country, if he is only left alone. As for deportation, the speaker did not think the authorities intended to take the kanakas by the

scruff and chuck them out of the State. The Act, however, said the kanakas were not to be employed, which meant that they would have to starve. Mr. Cameron thought, if the matter were placed before the Federal Parliament in a reasonable way, that the planters would be met; and he had much pleasure in supporting the resolution.

Mr. J. G. Fearnley (Cairns), in supporting the resolution, pointed out that the speakers who had touched upon the question had not treated one phase of it. Figures showed that 27 per cent. of the cane produced in Queensland last year was produced under white-labour conditions. Everyone, however, knew the great depression that had passed over Australia during the past few years, and there was no doubt in the speaker's mind that one great reason why white men had recently tackled the growth of sugar-cane was because they could get nothing else to do. No one could convince him that white men would work in the canefields when they could get anything else to do, and it seemed to him that in ordinary times the percentage of white-grown cane would be even less than it is now. White men were being forced to take to this work, and it did not seem to Mr. Fearnley that their own men should be compelled to do menial work that could be done by coloured labour. Years hence, the opening up of the country might make labour in the canefields a more healthy occupation than it was at present, but, as things were at present constituted, they were unfitted for the change which legislation would have them make.

Mr. E. S. Waller (Herbert River) had very much pleasure in learning that there were so many advocates for the retention of the kanaka in the country. With respect to white labour in his own district, he might say that there was great difficulty in securing such labour. On the Herbert River the only European labour available was Italian, fresh out from Italy. Those Italians had done good work, but their number was limited, and the planters could not get the numbers they wanted. They had had the white natives of the country. These men had come from Bundaberg, being forced by circumstances to go afield looking for work. They were mostly farmers' sons who had come up to the Herbert, and had given satisfaction. They were, however, very limited in number, there not being more than ten or twelve of them. The other whites tried had been total failures. Most of them were men who got drunk after a few days' work, and the planters had lost a good deal of time through employing them. The speaker was hopeful of seeing the time when all their cane would be cut by white labour, but at the present time it was quite impossible to obtain sufficient reliable white labour for their requirements. To keep the industry at its present size, apart from any further development, it would be necessary, therefore, to leave the kanaka in the country until there was a sufficient supply of white labour available to cope with their crops.

Dr. Macdonald (Geraldton), while not intending to offer any opposition to the resolution, pointed out that he was not a believer of one race exploiting the labour of another's. He certainly thought that every society should do its own thinking, its own work, and everything that pertained to that society. Just as surely as they did not work with their hands, so surely would one portion of their civilisation disappear from the face of the earth. Mr. Draper might think Dr. Macdonald was a crank, but he was one of those cranks who had given his life to the study of the subjects upon which he had spoken. If Mr. Draper thought his daughters were above the risk of having to work in the fields, then the speaker wondered whether Mr. Draper was equally confident with respect to the work his grand-daughters or great-grand-daughters might or might not have to do. If one race exploited the work of another race, it could not, according to the laws of evolution, exist beyond a limited time; and he asked why, by what right, could they exploit kanaka labour? If they could not carry on the sugar industry without alien labour, then what use were they? If they must depend upon alien labour to cultivate their lands, then surely must

they ultimately give up their lands to that alien labour; and, having given up their lands, would it require the gift of prophecy to foretell the fate of their manufactures, their trade, their Parliaments?

Mr. HICKS (Nerang) could not see that the employment of kanaka labour would result in harm to anyone, so long as no more of it was imported; and he had great pleasure in supporting the resolution.

Mr. R. S. AIKEN (Gooburrum) had been engaged in the sugar industry for twenty-eight years. During that time he had employed both kanakas and whites, and to those who would advocate the bringing about of a White Australia he would advise that the safest and quickest way to bring about that desirable state of affairs was to allow the kanakas in Queensland to gradually deport themselves. While on his feet, Mr. Aiken stated that he would like to say, in answer to Dr. Macdonald, that there was not an industry that had been reviled and misrepresented so much as the sugar industry. It had been insinuated that the profits of those who had been engaged in the sugar industry had been very large, but Mr. Aiken questioned whether there had been 100 men in Queensland who had made £1,000 clear profit out of sugar. He would not like to say, however, how many were not a sixpence the better for years of labour spent in the industry. But there had been scores of politicians who had been lifted from the gutter to draw £6 a week, and do their best to drag the industry down.

The CHAIRMAN: We shall arrive at a better conclusion, I think, if all personalities are refrained from in the discussion of this matter. I gather, however, from the paper read by Dr. Macdonald that he is quite agreeable to what has been suggested—namely, the settlement of the question by evolution. It may help the discussion if the following figures are given. While it has been said that 27 per cent. of the cane produced in the State last year was grown under white-labour conditions, yet the figures I am about to quote will show that the production of sugar by white labour in the district in which we now are—namely, the No. 1 district, or the cane districts north of Ingham, including, of course, Cairns and the Johnstone and Herbert Rivers—is evidently retrogressing, judging by the returns for 1904 against those of 1903. For, whilst in 1904 there was an increase of twenty-one in the number of white growers, yet the area of white-grown cane decreased by 131 acres. There was a decrease of 5,801 tons in the quantity of cane grown, and a decrease of 791 tons of sugar produced. The decrease in the amount of bonus paid in this district in 1904 as against 1903 was £1,480. In examining these figures, moreover, it should be remembered that 1904, on account of the hardness of the times, was a favourable year for obtaining white labour. I would here like to say that I have no desire to push this matter through with any semblance of haste; and if we cannot get through these resolutions to-day, then we will go on with them again to-morrow.

Mr. E. SWAYNE (Mackay): One word has been used in the discussion that I do not consider a fair or a right one, and that is the word exploit. If you give a man fair wages, and he is satisfied, you do not exploit him. This labour question has already suffered too much from misrepresentation, and the fact that the islanders are only too willing to return to Queensland after having once been here is sufficient refutation of the remarks that have been made, and I certainly do not think that it should go out to the world that we exploit the kanaka. They come here willingly, and they return freely. With regard to female labour in the canefields, I may say that I have a family, and if I thought that I would have to depend upon my daughters to get a living out of the land, then I would give the farm away. At the present time we know what the labour market in Queensland is, and we should ask ourselves seriously, Can the State at the present time afford to lose 7,000 agricultural labourers?

The motion was then put, and carried almost unanimously.

Mr. Swayne (Mackay): The third resolution is:—"That the Conference desires the amendment of the *Sugar Bounty Act* 1903 by the deletion of the following words in clause 2 of section 2—'Provided that no bounty shall be paid in respect of the production of sugar on land which has been cultivated by other than white labour, after a bounty has been paid in respect of the production of sugar thereon,' and that the provision contained in the Act when first passed, to the effect that all cane crops may be registered for bonus up to the 28th of February each year; and, if worked solely by white labour since the previous crop on that land has been harvested, shall then be eligible for bonus during the ensuing crushing season, shall be again in force." I may say that when the bonus was first passed everyone was given a chance to come under the Act up till the 28th January, 1903. After that, no cane was admitted to the bonus unless it had been planted and worked by white labour. The clause of the Federal Act that we now ask for the omission of, states that, in the event of a man once drawing a bonus, and then reverting to coloured labour, then that land is for ever deprived of the benefits accruing to the employment of white labour. If he once reverts to black labour, the land is disqualified, and even if he sold the land the disqualification still holds good. Such land can never again be eligible for bonus.

A voice: The cane; not the land.

Mr. Swayne: No; the land. The land is for ever disqualified. You can grow as many crops as you like by white labour on that land, but you cannot draw any bonus for so doing.

A voice: Supposing the land changes hands?

Mr. Swayne: Until the last few weeks the land was disqualified. That means a handicap upon that particular piece of land. I am now advised that during the last few weeks it has been decided that if a *bonâ fide* sale is effected the disqualification may be removed. However, it is most unfair that the original occupier should be debarred or discouraged from using white labour. As things stand at present, owners of scrub land in the Mackay district look to cane once planted standing and yielding crops for five or six years. We have known cane planted there to ratoon up to twenty years, but we can generally look to its lasting five or six years. Every year, therefore, the fresh crop is virtually a new one. The cutting of the cane requires labour, and we ask that if such land is kept clear of coloured labour, the crops raised upon it should be eligible for bonus. That really is the meaning of the resolution. What we wish is to leave an open door to enable men to give the white labour conditions a fair trial. I contend that, in moving this resolution, I am moving in the interest of the white worker just as much as in the interest of the white grower, for it is to the interest of the white worker that no land should be debarred from employing him. It stands to reason that, if a grower is allowed to come under the bonus system, he will naturally wish to employ white labour, provided such is available.

Mr. R. S. Aiken (Gooburrum) pointed out that the clause in question had debarred many owners from cutting up their plantations, and hence he had great pleasure in seconding the resolution.

Mr. L. J. Moody (Geraldton): In supporting the resolution, I must point out that what we are asking for is not a very great concession. The first part of the resolution deals with the Act as it at present stands, and I feel that the drafting of that clause was a fault in the first instance. It is very hard to permanently penalise a man through perhaps a mistake on his part for forfeiting his bonus, and tying up his land for all time. The second part of the resolution simply asks that we be placed in the same position as the growers who took advantage of the Act at the start of the bounty system. The bounty was introduced to encourage the employment of white labour, but there were a lot of men who had contracts to fulfil, and were consequently not in a position to immediately take advantage of the Act, even if they so desired.

They are now, however, in the position that their land is locked up, and they have to pay more for producing a crop than their neighbours did in the first instance. On the Johnstone River there are some men who are registered white cane-growers who planted the cane; they cultivated and trashed it by black labour. They then came in at the first part of the Act, and have been receiving the bonus ever since. We want to be put on the same position.

Mr. H. Hicks (Nerang) thought any cane planted after now should be planted by white labour, if it was desired to obtain the bonus in connection therewith.

Mr. B. T. McKay (Maryborough): The date mentioned, the 28th of February in each year, is the end of the crushing. The canefield has nothing growing upon it, and I think that if a white man takes possession of that field, and goes on to the 28th of February next year, he should have a right to the bonus; provided, of course, he has employed only white labour during the interval.

Mr. W. Griffin (of Nelson, Cairns) and Mr. G. A. Ball (of Killarney) both supported the resolution.

The Chairman: Whether the Minister will concede the request or not, I do not know, but it certainly seems a reasonable request to make. I was told in the Herbert River district that even the picking up of grubs by black labour was sufficient to disqualify a man from obtaining the bonus. If that is correct——

A voice: It is correct.

The Chairman: Then it is drawing the line very fine. When a man qualifies for the white labour conditions it ought to be compulsory that he cultivate his land, for we all know that land cannot bring forth grass, weeds, and cane too. It is amazing to us from the South to see the wonderful growth of weeds up here, but it enables one to understand the cost of cultivating a canefield. I can see how rapidly the weeds grow, and, if a man qualifies for a bonus, I think the Federal authorities might insist upon the land registered being cultivated. With all due respect to my friend Mr. Hicks, I do not see any objection to the resolution being submitted to the Federal authorities.

Mr. Hicks: I have no objection, but I think you are asking too much.

The Chairman: I think if the ratoon crops are grown by white labour, are properly cultivated, and are taken off by white labour, that then we shall not be asking too much if we ask that they be eligible for bonus.

The resolution was then put, and carried unanimously.

THIRD MEETING.

Tuesday, 16th May, 1905, 9.15 a.m.

Business was resumed.

The discussion on the sugar industry was resumed.

Mr. E. Swayne (Mackay: The next, or fourth, resolution I have to propose is—"That in the event of the Federal Parliament not acceding to the former request, *re* labour from the South Seas, the Immigration Restriction Act be so amended that reliable labour can be imported under contract from Great Britain and the Continent; or, in lieu of the latter, that arrangements be made for natives of New Guinea to be introduced for the harvesting of cane." It will be noted that this is simply an alternative resolution. It only asks, if the previous requests are not granted, that something else be done instead. If the carrying out of the previous resolutions is considered necessary, and is carried into effect, then this resolution, of course, need not be operative. It

might be of service to assist you in arriving at a decision in the matter were I to quote the following figures that appeared in a recent issue of the *Queensland Agricultural Jounral:*—

"The adult male population of Queensland is about 226,000, of whom 81,575 are engaged as working miners; 33,930 as owners or lessees of plantations, farms, orchards, &c.; 9,695 as dairy farmers, graziers, station managers, &c.; 11,189 are shearers, shepherds, stockmen, pastoral labourers, &c.; rabbit and marsupial shooters, well-sinkers and others engaged in water supply, number 1,355. Together these total 137,744, leaving a balance of 88,256 adult males. Only 4,570 males are returned by the Government Statistician as farm servants or agricultural labourers; 4,669 are engaged as working carpenters, bricklayers, hodmen, &c.; 7,950 are engaged in hotel and lodging-house keeping and as domestic servants; 3,924 are employed in legal work, defence, police, &c.; whilst teachers and tutors account for 1,269. Excluding farm labourers and including 1,000 wharf labourers, there remain 68,175. Now, if we deduct from these, 4,570 agricultural labourers and 7,498 workers of undefined occupations, we have a total of 56,107 males who carry out the whole business of the State as professionals, merchants, tradesmen, manufacturers, who manage the shipping business, the railways, the carrying trade, who man the civil service, and whose general business is distinct from agricultural employment. Taking the cultivated area of the State as 566,589 acres, it will be seen that for this vast area there are, exclusive of working proprietors, only 12,068 farm labourers and casual workers, giving an average of 47 acres per labourer."

From these figures it will be seen that there are only 4,470 persons in Queensland returned as farm servants or agricultural labourers. Now, it is proposed, under existing legislation, to deport the 7,000 kanaka labourers that we are utilising in connection with the sugar industry. In view of the number of agricultural labourers in the whole of the State, it is easy to see that the deported coloured labourers could not be replaced in Queensland, and we, therefore, ask, if the deportation takes place, that we be allowed to bring agricultural labour, under contract, from Europe. I think we all find it hard to get skilled agricultural labour. If this resolution were carried into effect it would be possible for men who came from the farming districts of Europe, and who know that good men are obtainable there, to send home to their friends and take steps for getting them out here. But, of course, we would have to advance or contribute towards the fares of these agricultural labourers, and we would naturally want in return that when the labourers came here they would work for us for a certain time in order to recoup us for the expenditure we had undertaken. Formerly we had assisted immigration, and under that system some of the best agriculturists we now have in the State came here. Many of these men are now employing large quantities of labour, and I know several who came here twenty years ago, and now have got farms of their own. And I contend that if we were allowed to bring men of that class here, we would be adding in a short time to the ranks of the employers of labour in the State. Such a system would be beneficial to the wage-earner, as well as to the farmer. There is another thing worth bearing in mind in connection with the condition of the agricultural labour market. Some have remarked what they consider the large amount of casual labour in the sugar districts of late years, but it must be remembered that the last few years have not been our normal times. The labour has been in excess of what we generally have, and this has arisen, in a great measure, through the bad times in other districts. The drought has driven men in from the sheep and cattle stations. There have been no Government works, and we have had about us a class of men who generally work at those occupations. It is, therefore, probable that when times get better out West, a good many of the men we have now in the agricultural districts will drift back to the West, and return to their old pursuits. We are hoping to see the Government take on public works again, and we are hoping to see mining go ahead. If so, there will be a further depletion of the white labour from the farming districts. The foregoing should explain my contention that the last few years have not been normal ones, so far as labour is concerned.

If this resolution is carried into effect, and the Government do not help us, then I think we would be able to bring out men ourselves. If the Act said we must not import labour to work under current rates, it would have my sympathy, but I think it is unfair that we should be debarred altogether from being allowed to import labour under contract. The resolution concludes with a further alternative. If our rulers deny us this request, then we would ask to be allowed to bring in labour from New Guinea. It should be distinctly remembered that New Guinea is a part of the Commonwealth, and it seems only fair that labourers in one part of the Commonwealth should be allowed to do work in another part.

Mr. N. P. Petersen (Aloombah): I have much pleasure in seconding the resolution, which explains itself. European immigration to this State is one of the grandest things that could happen, but it is hardly likely to come unless it comes out under contract. As things are at the present time, there is no possibility of getting Europeans here. I am satisfied that if agents were sent to the different parts of Europe that there could be procured, for settlement in Australia, thousands of good men and women, and that such immigrants would be of the greatest assistance to us. If we could let them understand that we would be able to provide for them, and what they would be likely to do when they came here, we would be able to import them by thousands, provided the Act was amended. Failing that, I do not see why we should not be allowed to introduce New Guinea labour until something else could be done. As things now are, the kanaka will go in the course of a year or eighteen months, and European immigration is practically at a standstill, so that we shall be, to all intents and purposes, without labour. New Guinea is in the Commonwealth, and I cannot see why the labourers there should not be allowed to come and work here.

Mr. F. W. Peek (Brisbane): The subject now before us is of vital importance, not only to the cane-grower in the North, but to everybody in the South, for, if you cannot get sufficient labour of a reliable character for any industry you may embark upon, you have no chance of competing in the same industry with those nations that have unlimited supplies of labour. I have been compiling a few figures, and want to make plain to you our position as compared with other nations in the matter of immigration. I find that in Australia, since our first landing here, we have grown in population to the extent of 3,771,715 persons. We have taken 120 years to attain that number. In the early days of Australian history we increased annually at the rate of 11.07 per cent., but during the last ten years the percentage of increase has only been 1.17 per cent. per annum. Such figures speak for themselves. Between 1861 and 1890 the excess of arrivals over departures from the Commonwealth was 780,895 persons, or an average of 26,000 a year, for the whole of Australia. Compare these figures with those of America, where we find that in one year there landed at New York no less than 714,124 persons.

The Chairman: They have an Immigration Restriction Act in America.

Mr. Peek: But they have statesmen in America. It is not a few words of a British or European tongue that they ask for, but the consideration is the almighty dollar.

A Voice: They must be able-bodied.

Mr. Peek: Canada took 120,000.

A Voice: And took them down, too.

Mr. Peek: And is offering facilities for the immigration of 10,000 farm labourers this year. The policy of our Federal Government, however, has been that of putting a barbed wire fence around Australia. In the following figures I am taking Australia as a whole, because the same conditions apply to all the Commonwealth. In 1901-2, which are the latest figures that I could get, our agricultural products were worth £22,835,000, while our pastoral and dairy products realised £36,890,000, and this during one of the greatest droughts

that has ever struck Australia as a nation. The manufacturing output was worth £64,256,000, and the value of the mineral products £22,000,000. Such figures show practically what the nation is doing, and a few figures from California may be interesting in comparison. In 1901 there were shipped eastwards from California 64,591 car-loads of fresh fruit and 26,000 car-loads of oranges. There were 80,000 tons of beet sugar raised in California, and there were 2,325,000 cases of tinned fruits packed. I just quote these figures to show what statesmen, with heads on their shoulders directed towards the development of their country, can do. Americans never exclude Americans from sharing in the work of the country, and why should we prevent one part of the Australian dominion from entering another part? If there is labour available in New Guinea, then it is its duty to come to us, and assist us in the development of our resources.

Mr. W. S. Palmer (Bowen): I would like to know what Mr. Swayne considers a fair wage to offer a European. Personally, I cannot see the use of clearing out the kanaka if we are going to get New Guinea men. If the Papuan is brought here, I would like to see him confined to the sugar industry.

Mr. A. Rickert (Allora): It has given me great pleasure to listen to the discussion so far, for it is only right that the Southern delegates should get some information up here, to bring back to their respective societies, dealing with the wants of the Northern people. So it is with that object in view that I would like to ask the mover of the resolution a few questions. What we want to know, at the other end of the State, is, that if you have reliable white labour, at, say, reasonable wages for a white man, for the portion of the year when the cane is being harvested and crushed, will you Northerners, when white men venture up here from the South, employ those men at, say, half wages and their rations and reasonable shelter, to keep them in the North the remainder of the year until the sugar season commences again? In short, would you undertake to employ all the year round a desirable class of white labour if it came North? That is a question that I would like sugar-growers in this end of the State to answer.

Mr. T. Ryan (Mossman) said he would support the resolution, as he considered it a very good one. In reply to Mr. Rickert, he would state that reliable white labour could get from 20s. to 25s. per week all the year round in the North. He had hired kanakas at 15s. per week, but they were really costing him 25s. a week. He reckoned that if he could get white men at 6s. a day it would pay him.

Mr. A. Rickert (Allora): I think, as a rule, as regards white men, if they come up here they will want the ordinary rate of wages. You can leave that to the white man, and they will earn their wages, too. I am, however, sorry to see the last part of the resolution.

Mr. Swayne: It is an alternative.

Mr. Deacon: I think it is unwise to insert it. I am only speaking of my impression of the state of public opinion down South, and in the other States. I think it is hopeless to expect that there will be fresh arrangements with regard to the importation of kanaka labour.

Mr. Swayne: New Guinea is a part of the Commonwealth.

Mr. Deacon: I do not believe in the deportation of the kanaka. Let him stop here as long as he will; but I think I know something of the feeling of public opinion down below, and I am quite certain that the last part of the resolution will do more harm than good.

Mr. D. MacBrair (Sunnybank) suggested that it might be possible to get harvest gangs from New Zealand for the Northern canefields.

Mr. E. Swayne (Mackay): In reply to the question relative to wages, I do not know whether it was put to me personally, but I can only speak for

myself. At the present time I have two men on at £65 a year each, clear, all the year round, and I find them in everything. As Mr. Deacon very truly remarked, if the work is here for them to do and it will stand the wages, then you may be quite sure the men will get the wages. I think we all know that when work is plentiful men always get fair pay.

Mr. Rickert: Will you keep them up here when they are here?

Mr. Swayne: Of course, we all know that work is not so brisk at one part of the year as at another. But I really think there is more work to be done in connection with cane during what is called the slack season than during the slack season of most other crops.

Mr. Rickert: They need not leave the district through want of work?

Mr. Swayne: No; I do not think so. Of course, at the harvest time, more men are required than at the slack time; but there is always work to be found in a sugar district. With respect to the second part of the resolution, I may point out that it is not kanaka labour that is asked for. It is simply an alternative that, if the deportation is insisted upon, we then be allowed to get these people. If our previous requests are not agreed to, where shall we be? One gentleman said it was not the intention of the Federal Government to chuck the kanaka out of Queensland by the scruff of his neck, but the effect of the law will be just the same. They will have to go, because it will be illegal for anyone to employ them. Then, if we are not allowed to get good agricultural labour from Europe, we ask for New Guinea labour. New Guinea is simply the last resource. If everything else is refused, then we ask for that.

Dr. Macdonald: I would like to suggest, as a possible alternative, that some definite motion might be put asking the Queensland Parliament to create a special bureau for labour for tropical agriculture. A good deal might be done in this matter by people who have the time and are in touch with the whole Commonwealth. I believe that, if the matter was developed along definite channels by the Queensland Government, we might then be able to force the Commonwealth Government to form similar bureaux in other parts of the State.

Mr. Swayne: I think the suggestion is a good one, and a similar request has been made before by the farmers.

Mr. D. Pearson (Herbert River): Just a few words with further reference to what Mr. Swayne has said. I have always employed three white men, and often four or five. I am cultivating 250 acres. During the time I have had the white men, I have never paid them less than £5 a month, and I have always paid them, wet or dry; and paying in wet weather is a considerable item in our district, as we lose many weeks during the first three months of the year on that account. When the men are specially deserving, owing to harvest work, they get as much as 30s. a week. That is all the year round, and I do not think the agricultural labourers get any better treatment in the South.

Mr. Swayne: It may be mentioned that this particular resolution was carried here in Cairns a week or so ago.

The resolution was then put, and carried without any dissentients.

Mr. Swayne: The next resolution I have to trouble the Conference with is—"That, in the opinion of this Conference, unless immediate action be taken to give effect to the foregoing resolutions, the sugar industry must perish." This and the previous resolutions we have carried at this Conference have been unanimously agreed to by the sugar-growers here, and the wording of the present one shows how the cane-farmers feel on the matter. This resolution was also passed some weeks ago by the sugar-growers here.

Mr. W. S. Palmer (Bowen): I can go with you with respect to the matter of the bonus, but that the industry is going to perish, if the kanaka is withdrawn, I do not altogether agree with.

The Chairman: The resolution does not say that the industry will perish if kanaka labour is withdrawn, but that it will perish if a series of contingencies happens—namely, if the employment of kanaka labour is prohibited, if the bonus is not continued, or the concession with respect to the importation of European labour be not granted.

Dr. Macdonald: We must not assume as a matter of course that labour cannot be obtained in the Commonwealth. I would suggest that the following resolution be substituted for Mr. Swayne's:—"That, in the opinion of this Conference, unless immediate action be taken (embracing a labour bureau for obtaining labour within the Commonwealth and elsewhere) to give effect to the foregoing resolution, the sugar industry must perish."

Mr. Swayne: Without saying, one way or the other, whether I am prepared to accept Dr. Macdonald's amendment, I may say that about twenty delegates were concerned in the framing of my resolution, and I am simply the mouthpiece of those twenty.

Mr. Deacon (Allora): I should like to say that, as a supporter of Dr. Macdonald's idea, I think it should be brought forward as a supplementary resolution. I do not believe that the sugar industry is going to perish. However, it would probably be best to have Mr. Swayne's motion decided, and then we can discuss Dr. Macdonald's proposal. I look upon the latter as a very important one, because a good deal might be done, not only in the supplying of labour to the cane-farmers, but also the wheat-growers.

Mr. C. F. M. Fischer (Zillmere): I had made up my mind not to vote on Mr. Swayne's resolution, not because I was not in sympathy with the importance of the sugar industry, but because I did not feel competent to be a judge, even to the extent of giving my vote; but since Dr. Macdonald has proposed an addition to the resolution I think there is no reason why a vote should not be carried as unanimously as any of the other resolutions that have been passed. With that proviso, I do not see how anyone from the North or South should not be able to give his support to the resolution. Machinery seems to be out of the question altogether, and I suppose it is looked upon in the North as an entire failure. I happened, however, to run across a gentleman in this city yesterday who is confident of perfecting a machine that will settle many of the labour difficulties in connection with cane-harvesting.

Mr. Swayne: I understand it is proposed to substitute the doctor's resolution for mine?

The Chairman: It is suggested that the doctor's resolution take the place of the one you proposed. If you do not like the idea of the substitution, then the doctor's proposal can come before the Conference in the form of an amendment to your motion. But it seems to me that the doctor's resolution embraces all that is in your's, and more. Even if your resolution is carried for obtaining labour from oversea, it will be necessary to have a labour bureau, and someone to organise and direct it.

Mr. Swayne: We say that if the kanaka is withdrawn, if the bonus is not continued, or if we are not allowed to get labour from Europe or New Guinea, we believe that the industry will perish. If we adopt the doctor's resolution, we have another alternative; but is it a sufficient alternative to meet the case? Of course, I am quite in favour of the doctor's idea of establishing a labour bureau.

Mr. H. E. Bray, of Tinana, did not consider the doctor's amendment necessary.

Mr. W. G. Winnett (Beenleigh) stated that, although a representative from a small sugar-growing district, he had not been consulted in the framing of Mr. Swayne's resolution, and personally he considered that Dr. Macdonald's resolution covered everything that was wanted.

Mr. A. W. CAMERON (Maryborough) thought that, as they had hitherto been so unanimous, it would be a pity for them now to split up their forces.

Mr. R. S. AIKEN (Gooburrum) was inclined to agree with Mr. Cameron. Whether they believed or did not believe that available labour was in the Commonwealth was immaterial. If a bureau were established, it would have the effect of definitely demonstrating whether the labour was in Australia. He, therefore, thought they could accept the doctor's amendment with the best of grace.

Mr. A. J. DRAPER (Cairns) thought there was very little in the amendment. But it would be another string to their bow if the Federal authorities established a bureau; if it was thereby proved that there was not sufficient labour in Australia, then their claims for permission to introduce labour from outside would be greater.

Mr. SWAYNE: I naturally wish to be quite clear as to what I am doing when consenting to any alteration in my resolution. Several have spoken, and it seems to me that we shall in no way compromise the effect of the resolutions we have already passed by accepting the doctor's resolution. With your and the doctor's permission, I will therefore move, as my own motion, Dr. Macdonald's resolution.

Mr. W. GRIFFIN (Cairns) seconded the resolution, and stated that six months ago he had received letters from bodies of men in the South asking for particulars of the wages given to men employed in the canefields in North Queensland.

Mr. W. DEACON (Allora) said he would give the motion his hearty support.

The resolution (as proposed by Dr. Macdonald, and adopted by Mr. Swayne) was then put, and carried unanimously.

Mr. E. SWAYNE (Mackay): I have now to propose my sixth and last resolution:—"That, through our Chairman, we ask our State Premier to forward the foregoing resolutions to the Federal Minister, with strong representations that they be given effect to." Before sitting down, I would like to thank our Chairman for the sympathetic way in which he has dealt with the resolutions, and if he ever desires support from the farmers of Queensland I am sure he can rely on them rendering him that support.

The resolution, having been seconded, was then put, and carried unanimously.

The CHAIRMAN: I shall take good care to convey these resolutions to the Premier, and inform him that they were made by delegates from sixty-two societies, forty-one being from the Southern, one from the Central, and twenty from the Northern districts.

AUXILIARY TROPICAL PRODUCTS.

[By Mr. HOWARD NEWPORT, F.R.H.S. Inst. in Trop. Agric., Cairns, May, 1905.]

The introduction of tropical industries, whether auxiliary or staple, into tropical Queensland is attended with especial difficulties. Queensland is the first country in the world that is making any serious attempt at tropiculture with European labour, and the fact of the absence of the cheap or coloured labour, usually to be found in connection with the culture of tropical products, is one of the most potent difficulties, not necessarily because the successful production of such products is impossible with the more expensive white labour, but rather on account of the fact of their being cultivated in some other country by means of such labour.

Other obstacles are: The absence of ideas of permanent settlement, which render the suggestions of any product likely to take more than one season or so to attain maturity or come into bearing distasteful, because of the idea of permanency it embodies; and the speculative spirit of the times, which would rather see any little available capital invested in something capable of a sudden "rise," or something readily realisable. This is, perhaps, but a phase through which the country must pass, and as time goes on the desire to make money

suddenly and get away will give place to ideas of permanent residence. This speculative spirit of the times fosters a species of temporary agriculture as opposed to the more permanent, and also works antagonistically to the natural effects that competition should produce, insomuch that to make the value of the product cover the cost of production the ideas and efforts of the producers are unduly turned towards an artificial increase of the price rather than to the reduction of the cost of production.

The formidable handicap that is thus exercised on any efforts to introduce new staples can be understood. On an auxiliary product being suggested, the possible points of difficulty are picked out. This is only as it should be, and to ignore such would be foolish. To think out and provide against such is essential to success; but it is, unfortunately, often not with any idea of overcoming them that possible difficulties are picked out, but to brood over them, and make insurmountable mountains out of what need not be more than mole hills. And it does not take much brooding in a pessimistic spirit to multiply the difficulties in the imagination one hundredfold. To find a staple without any difficulties or disabilities whatever would be, indeed, a difficult task, for it seems a provision of Nature that, if special effort in some direction in connection with the culture is not necessary, the virtue of patience must be exercised.

Any staple suited to the conditions of the tropical parts of our State is almost sure to be found under cultivation in some other tropical country, and by coloured labour. Consequently the first objection raised is that of the difference in the cost of the labour here and there. To those who can see no deeper than the surface, this difficulty seems insurmountable, or, at any rate, the only way out of it is for the price of the product to be raised by some means to correspond with the difference in the daily wage of the labourer. This is, however, by no means the conclusion of the whole matter, and there are other considerations that weigh heavily in the effort to balance matters and enable successful competition. The cost of transport, quality of soil, and salubrity of climate are by no means small factors, but the most potent is the possible modification of the methods of culture or preparation of such products to suit the existing conditions of labour.

To the question, What can we grow? the alternative that presents itself is the adaptation of temperate or cold climate products, if possible, to the tropical conditions of climate and soil on the one hand, or the modification of the methods of culture of tropical products to the conditions of labour existing on the other hand. In the former alternative there is grave fear of so reducing the quality of the product as to render competition impossible; and it is the latter that presents, obviously, the line of least resistance, and which is the most practicable; and it is along this line that the Department is working and on which it has far greater prospects of success.

The modification of the methods of culture or preparation of any product takes time, and may quite possibly involve the development of peculiar, hitherto unknown, or previously unnecessary characteristics in plants or trees, or the production of new machinery to treat a particular product.

Auxiliary products may be divided into two classes—alternative staples and subsidiary crops.

Alternative staples may be taken to mean crops of a more or less permanent nature, that may be grown at the same time as already cultivated staples, and in areas of some extent, if not as great as the main or primary staple. Subsidiary crops, on the other hand, may be taken as crops not capable or advisable of culture in large areas, less permanent in their nature, though not necessarily so, and crops of such a nature that they can be carried on in close connection with the primary staple.

In the selection of alternative staples it is advisable to limit one's self. However many small subsidiary crops may be managed on the farm or selection, one alternative staple is generally ample, and indeed all that is likely to obtain the requisite attention. An alternative staple will require generally conditions of soil as good as the primary staple, although there will be some scope for selection in this direction. The advantages of such a product are obvious, and the especial points that would lead to the selection of one would be the difference of time or season of its harvesting, when the most labour is required, and the similarity of its processes of cultivation so that the same implements, buildings, &c., can be utilised; but dissimilarity of habits of growth in other respects, such as non-susceptibility to frost or drought, &c. Such staples are essentially protective, saving the farmer or settler from financial embarrassment in case of loss of crop

by unsuitable conditions of weather or undue fall in prices of one or the other in a given season. Thus, what is a main staple in one district may quite possibly be suitable as an alternative in another, or, starting in a small way as merely a subsidiary product, may be chosen from among several others for more extended cultivation.

It would be invidious to attempt to lay down any finite laws of the fitness of any one staple with another, for such are governed by local conditions, and must be decided by the cultivator himself; and it will be sufficient in this paper to suggest the special points of a few such crops, and the lines on which they may be made to fit in with existing staples.

COCOA.—This is what may be called a permanent crop—that is, one that once planted, continues to grow and bear without replanting for many years. Cocoa has been tried up here, and proved quite possible as a crop. This staple is somewhat delicate when young, requiring some attention and special cleanliness in the matter of weeding. It has a very sweet sap, and is consequently preyed upon by grubs and insects when young, though it gets hardier with age. It requires a well-drained and rich soil, and does better under a partial or light shade than in the open. An ideal shade for such permanent crops as cocoa, coffee, &c., is the Erythrina family, which are leguminous trees standing in the same relation to permanent staple crops as such plants as cowpeas and beans to cereal crops—that is, as a host for nitrogenous bacteria, especially evidenced in the nodules on the root growth.

Cocoa is a crop that is always saleable and more reliable in this respect than many others. The crop ripens here from August to October. The returns run to about 10 cwt. per acre, valued at £60 to £75 per ton.

The treatment is simple, drying being the process that takes longest and requires most space. No special machinery is requisite. The first returns are available in about four years, and the trees do best on flat or slightly undulating land.

Another is COTTON. This is in this country a perennial, but is not so permanent as the foregoing. So much has been written and said about this staple that I need not go into any detail here beyond mentioning the points likely to fit in with other staples or *vice versâ*.

The returns per acre may be taken at 1,000 lb., of which some 70 per cent. is seed and 30 per cent. lint. The gross value in the seed is about 2½d. per lb.; the value of the lint may vary from 4d. to 1s. per lb. The seed, if ginned on the estate, gives valuable by-products in the shape of oil and manure, which by-products could be used for the support of an alternative crop. If machinery is used for the primary staple, the cotton machinery—gins, which cost about £25—can be worked with very little extra cost. The harvesting season is from about April to July, and requires some considerable labour. The field operations consist of one ploughing and one pruning per annum and scarifying from time to time. The first returns from planting are available in about eight months.

COFFEE is, again, a permanent crop. This also requires special attention in the matter of weeding at first; the first returns are obtainable in the third year. The remarks regarding shade trees mentioned in connection with cocoa also apply to coffee. The cost of machinery for pulping is about £25; subsequent curing operations, including the negotiations of sales, are now being undertaken by the Department in the interests of the growers. The field operations consist of one ploughing and pruning per annum and light scarifyings. Harvesting lasts from May or June to September or October, and requires some labour; the field work at any other time of year leaves ample time for attention to other matters. The soil best suited is loam, slight sandiness being of no disadvantage; and the best lay, flat to undulating. The plant is susceptible to frost, which must be provided against by belts of standing timber, if feared. The returns run into about 10 cwt. per acre, of the value of £70 to £100 per ton.

RICE.—An annual crop maturing in a few months, which could be profitably grown in large areas by the use of seed drills and harvesting machinery. For the dry or hill varieties of rice undulating uplands may be utilised, but the best results would be obtained from cultivation under irrigation. Low-lying country could be utilised, which would, however, need to be drained as well as have a well-regulated supply of water for irrigation purposes. The crop is saleable to mills at present at about £6 10s. per ton, and the returns are ¾ to 1¼ tons per acre. The sowing season is about January here, and the reaping about five months later.

The advantages of irrigated rice over dry or hill rice lie in a more even grain and control of the ripening. The present common Chinaman's method of cultivation does not pay. Sowing in clumps produces irregular ripening and a grain that breaks in the husking rollers.

Tobacco.—This is another quick-growing crop, but is much more dependent on the weather than others. The production of a good cigar leaf, although tried unsuccessfully some years ago in the district, has since been shown to be quite possible with due care in the selection of soil and locality and due attention to the details of its culture. Some considerable attention is necessary to the germination of the seed, which should be planted during March or April. The field requires proper working up, when the plants may generally be successfully planted out in April or May. They grow quickly, but insect pests have to be watched for and removed, especially during the first few weeks of growth. The harvesting takes place some nine to ten weeks later, and in the dry season. For this crop a comparatively large area of drying sheds is required, which is, however, only occupied by the tobacco for three months or less in the year. The crop is heavy and the returns large, though variable. The price depends upon the quality of the leaf, which in turn is largely governed by the amount of attention accorded both the culture and the curing. No machinery is required.

Fibre.—This is also a permanent crop, and one that requires a considerable area to make it pay satisfactorily. There are many varieties that may be adapted to a variety of soils, localities, and climatic conditions. For low-lying ground the Manilla hemp, a species of musa or banana, would be suitable, as also would ramie or rhea; this latter, however, requires special machinery and treatment. For high ground or the utilisation of poor ridges, &c., Sisal (*Agave rigida*), Mauritius (*Fourcroya gigantea*), or Bombay Hemp (*Agave vivipara*) would be suitable.

These latter fibres, as also others of the Aloe family, can be treated by the same machinery. If power is already available, this extra machinery necessary to treat fibres would not cost more than £25. This product has special advantages in the fact of its being possible to harvest at almost any time of the year or continuously all the year round once the estate is in full bearing. The first returns may be expected in about three years from the time of planting. The returns per acre run from 600 lb. to 1,000 lb., and the value of the prepared fibre from £25 to £35 per ton. A large area for housing and drying is not necessarily required, as the fibre is quickly dried, and may be baled and despatched within a few days of harvesting.

The special utility of subsidiary crops lies in the utilisation of by-products of a primary staple, so as to turn to some account what would otherwise be wasted, and there are often many by-products on a farm wasted for want of opportunity for use, and also utilisation of small patches of land on a farm that are too poor to plant under the primary staple, but which it is, nevertheless, advisable to keep cultivated, which it may not be convenient to have under grass, or which from their nature or situation cannot be regularly worked. Should there be a poor ridge running through the cultivated area of the farm, it is advisable that something be done with it, for if left it only proves a nursery for seed of noxious weeds or a breeding ground for pests.

Moreover, close settlement is as necessary and desirable on the farm as for the country as a whole, and the expense of the neglect of such areas is often far more than is imagined, and would pay for the planting up of such with a suitable product, were possible returns not calculated upon at all. Again, there is often land wasted on a farmstead or selection, along roadsides, or at the edges of fields, where useless scrub trees are permitted to grow, or equally useless, but possibly ornamental, trees planted.

Under such circumstances, or where wind belts or shade trees are required, rubber will at once commend itself. It is true some time has to elapse before any returns are obtainable, but meanwhile little or no expense need be incurred for cultivation. If appearance is desired, many of the rubber trees are most handsome in foliage and in shape. For quickly covering the ground there are varieties to choose from, as also for rough and stony soil, for poor soil, for rich soil, or for heavy or swampy soil.

A drive or avenue of rubber trees would be most handsome, and infinitely more useful than such trees as poincianas or mangoes, which are so commonly seen; and there is no reason why the trees alongside the road, round the farm,

or even in the paddock, as shade for the stock, should not be made to serve two or more purposes, and grown with the definite object of eventually paying for their keep as well as everything else on the farm.

I have mentioned rubbers. Of these some five or six varieties are available from the Department. The best rubber, that known as Para, is procured from the *Hevea braziliensis*, a tree which takes ten years to come into bearing, and attains a height of 60 to 70 feet. This is said to grow well in swamps, but it certainly also thrives in well-drained localities. It favours especially higher elevations and rich soil. The next best is the Central American rubber, obtained from the *Castilloa elastica*, a straight-growing tree that attains a height of 100 feet or more. This prefers undulating and well-drained localities, and will not grow well in low-lying wet lands. The latex of these is obtained by cutting the bark, and is collected in small vessels to be subsequently treated in the house or barn.

The Indian or Assam rubber, obtained from the *Ficus elastica*, is particularly valuable in this country, not because of its intrinsic value, which is considerably below that of the two foregoing; but on account of the fact of the latex coagulating on the tree, and consequently less labour being required for harvesting, a consideration where labour is at a premium.

Spices, again, might be a source of no inconsiderable revenue to the farmer in a small way from trees grown in out-of-the-way corners. Those spices that are produced on the larger tree, such as nutmegs, cloves, pimento, &c., are all somewhat delicate as seedlings, and, moreover, unfortunately take a long time—seven to ten years—to come into bearing. When they are in bearing they certainly pay, as no cultivation is necessary, and often nothing more required than the collecting of the produce. With some, careful treatment is required to preserve the peculiar properties of the spice, as is the case with mace, but the price is generally correspondingly high.

The spices I would especially draw attention to, however, are the smaller plants from which vanilla and cardamoms of commerce are obtained. Vanilla, as you all perhaps know, is a species of orchid, and is grown upon another tree which acts to a certain extent as its host. It is also grown in the open in some countries, but here it has been found that partial shade is advisable. I have it growing and bearing well at the State Nursery on mango trees, the vines being looped between the lower branches while the partial shade is obtained by cutting out the centres of the trees. The shape of the flower is peculiar, and the insect—a moth—that makes a speciality of fertilising it not existing here, the pollination has to be done by hand. This is, however very easily accomplished, and is most interesting. The vines are propagated by cuttings, which come into bearing in about eighteen months, and continue to grow for many years. The pods, which are 6 to 9 inches long, and about as thick as a carpenter's pencil, take many months to ripen and require somewhat careful treatment in the matter of curing. Vanilla varies in price from 5s. to 35s. per lb. of dried pods, according to quality and supply. Very heavy returns per acre have been obtained, in some countries reaching some hundreds of pounds per acre.

Cardamoms are the pods of *Elettaria Cardamomum*, a plant in appearance very like the common wild ginger. The pods are produced at the base of the plant on long racemes, which lie along the ground. The pods are cut, sweated, and dried, and are marketable at prices varying from 10d. to 2s. 6d. per lb. The cultivation of this product is simple in the extreme. It requires dense shade, and, therefore, scrub land is essential. This need only be brushed and the plants may be put in about 6 to 10 feet apart. Under such dense shade only occasional weeding is necessary, and this merely a sickling. Cleaning round the stools of the plants is advisable previous to the blossoming, when the dead fronds may be cut out. The plants take two years from the seed, or eighteen months from planting out, to come into bearing.

Closely allied to such products are those producing oil, such as sessamum, castor, ground nuts, linseed, &c., the by-products of which fit in with other staples by providing fodder and manures; also gum and resin producing trees, such as copal, gum arabic, &c.; and drugs, such as liquorice, Peruvian mastic, kola, anise, &c.

As a subsidiary crop the tree producing divi-divi, a tanning material, is valuable, being suited to dry situations, poor or rocky soils, and requiring no cultivation. The tree takes three to four years to come into bearing, and covers the ground well, largely preventing the growth of weeds, &c. The harvesting takes place twice in the year, a heavy crop and a light crop.

The ground is chipped clean beneath the tree, and pods raked up as they fall or are shaken off. It is necessary to gather the fallen crop previous to rain, which will spoil it. The returns amount roughly to 1 cwt. per tree, and is worth £10 to £12 per ton.

Many other subsidiary crops might be mentioned did time permit. I can only just touch upon fodders, which are not receiving the attention they deserve in the North here. Hay and chaff is largely imported from the south that might very well be grown; and the value of such fodders as cassava, which may be ground, dried, and preserved in the form of meal or cake, and be thus capable, not merely of being preserved, but of being conveniently transported, have not been sufficiently realised. Both as green fodders and as items of produce for which a market could be worked up in the south are many tropical fruits and vegetables capable of being packed so as to travel, among which may be mentioned the choko, egg fruit, and okra; the breadfruit, Jack fruit, avocado-pear, longan, &c.

The items mentioned in this paper are available at the State Nursery, Kamerunga, Cairns, in the form of seeds, plants, cuttings, or roots during the season, and many of them at any time of year.

The Chairman: Better evidence of the value of the paper could not have been given than the attention that was evidently excited during its reading. *Multum in parvo* characterises the essay, which was full of interest and of profit, too, if the suggestions that it contains are adopted. The Conference will make its usual adjournment now for twenty minutes, during which time Mr. Newport will be glad to answer questions, semi-privately, from those who are interested on the subjects of which he has treated. I understand, moreover, that most of you intend visiting the Kamerunga Nursery before you leave Cairns, and Mr. Newport will then be able to afford further information.

On the reassembling of the delegates, the following resolution was moved by Mr. W. S. Palmer, of Bowen, seconded by Mr. F. G. Jones, of Biggenden, and carried:—"That this Conference is deeply thankful to Mr. Newport for his inestimable paper on auxiliary crops, which clearly proves the justification of the establishment of the institution which he so ably manages; and this Conference also trusts the Government may extend such institutions wherever it may deem it necessary."

The next business was the reading of the following paper by Mr. A. Hunter, of the Lockyer Agricultural and Industrial Society, Laidley, on—

IMPROVEMENT OF THE QUEENSLAND FODDER MARKET.

[By A. Hunter.]

This is a subject which, as you will no doubt admit, is one of great moment, and which I am sure is commanding a great deal of consideration from the farmers of this State to-day.

My reason for bringing it forward is not that I am able to conclusively show how it can be immediately executed, but that a discussion on the subject, at a Conference so well and fully represented as this, will, at least, bring forth the general opinion on the matter, and surely some good practical suggestions will accrue.

The subject of this paper has been only too apparent to the producer for the last few years, on account of the small and unremunerative prices that have ruled for fodder, owing to the increased output and the decreased demand. The increase in supply is no doubt due to land which has been turned from canefield into fodder crops, which change has been considered advisable owing to the deportation of the kanaka. If the supply is on the increase, as it undoubtedly is, immediate action should be taken to find foreign markets for our produce.

A Queensland farmer visiting the other States of the Commonwealth is immediately impressed with the comparative remunerative and consistent prices for the ordinary products of a farm, from a bale of hay down to a barnyard rooster. Under ordinary circumstances, Queensland fodder could be placed on the New South Wales market to advantage, if the necessary action were taken (by the Government, if need be) to remove the prevailing stumbling blocks to such export, as, for instance, excessive freights, dues, plague restrictions, &c. Farmers are at a loss to know why New South Wales should be closed to Queensland fodder on account of plague, when it prevails in each State. The following

newspaper paragraph on this subject goes to show to what extent this restriction to trade is carried. Surely some interference on the subject is necessary on the part of our Government:—

"Restrictions on Queensland Trade.

"Our Rockhampton correspondent wired last night:—Mr. P. C. Marwedel, manager for Messrs. Allen and Co., Rockhampton, shipped twelve horses by the steamer 'Wodonga' on Tuesday night, consigned to Mr. Dodds, horse-buyer, Sydney. A telegram received in town to-day stated that the Sydney health authorities advised that no fodder would be allowed to be carried between Brisbane and Sydney, even as horsefeed. The 'Wodonga' will leave Brisbane on Saturday, and arrive in Sydney on Monday—a voyage of at least forty hours. This means that the horses would starve if fodder alone was depended upon, but it is probable that arrangements will be made to feed the animals on bread."

Within the present year, quantities of fodder have been railed to New South Wales from the Lockyer district, and the railage on this produce to its destination represented a highly remunerative price to the farmers. If even a limited market were found outside of the State, it would, to a great extent, relieve the producer by avoiding a "glut," which is ruinous.

A farmer, complaining of the market to the ordinary business man of Northern Queensland, is at once advised to get his fodder up in more marketable form, and I am afraid few farmers realise to what extent this advice affects them, as by putting up fodder in a way that it can be conveniently handled, of course, reduces the cost of transit. In this respect, however, the farmer is at a disadvantage, as the produce merchant or the "inevitable middle-man" is conversant with it, and, needless to say, makes full use of the knowledge, as fodder is bought from the producer in a comparatively rough state, put in a marketable form, for which no doubt satisfactory profits are made, and the produce merchants are too wary to advise the farmer to their own detriment. There is no doubt in my mind that if the farmers were conclusively shown that, by altering their method of getting fodder up, prices would be more remunerative, it would be at once carried out.

That our fodder could be placed outside of the Commonwealth, is apparent to me. As the quality is undoubtedly good, it could be prepared to ship anywhere, and got up to suit requirements. A recent visitor to Britain, after having practical experience in British fodder, expressed a strong opinion that lucerne, well cured and suitably got up, would find a ready market throughout the British Isles, and would, in his opinion, surpass any of the fodders in use there. If the Department of Agriculture would send first-class samples of Queensland fodders to different markets of the world, such action would be highly appreciated; but care should taken that nothing but first-class stuff be sent.

By relieving Southern Queensland of a quantity of its fodder product, it would also greatly relieve the Northern producer by reducing the keen competition which at present exists. As far as I can see, the chief hindrance to export of fodder from Queensland lies in the prohibitive freights ruling, and I do not see that the Government would be at fault if shipping facilities were provided by them to relieve us of our surplus produce.

In my opinion, if the following ideas could be carried out the position of the Queensland fodder producer would be greatly improved:—

1. Fodder to be put up by the producer in a more marketable form for export.
2. More favourable freights, dues, &c., to be arranged.
3. The consumer and producer brought into closer touch with each other.
4. Government inspection of all produce exported.

This was succeeded by—

WHEAT TRANSPORT, STORAGE, AND GRADING.

[By J. M. Hunter.]

Wheat-growing in Queensland has reached, if it has not passed, that period in its history when the farmer's whole concern begins and ends with the putting in and taking off his crop. He may perform both of these important functions with consummate skill and intelligence, and yet, at the close of the year, on balancing his accounts, find himself poorly recompensed for his labours. The introduction of up-to-date labour-saving appliances in Queensland during recent years is only the adoption of a part of the agricultural economy of to-day. All the world over, labour-saving appliances are at work on the farm, so that in every market where

the Queensland grower would dispose of his product he is met in competition with grain produced equally cheaply. It therefore follows, as a consequence, that a reduced cost of production by this means does not of necessity ensure a corresponding increase of profit to the grower. There are, however, numerous ways in which the cereal-grower of this State might be saved expense in the handling of his crop, which it behoves both the Government of the day and the farmer to give careful attention to. With that object in view, I venture to address this Conference briefly on the subjects embraced in the heading of this paper. Every cereal-grower who recognises the advantages to be gained by

Grading Wheat

for seed (in the process of which all foreign and unmatured grain is eliminated) will readily follow me when I say that this is the first and least expensive step in preparing grain for the market. While I merely mention this phase of the question in passing, I would remark that it is fatal to successful farming to allow the process to end there, and it is with this aspect of the matter I particularly wish to deal. It is well known that, be the seed sown never so good, the crop produced will contain a percentage of inferior grain. To remove that from the prime wheat and secure a uniform bulk sample should be the aim of every grower who wishes to obtain the full market value of his grain. How to obtain this object at a minimum cost is the problem which those interested in the industry are invited to consider. The hand-grader, manufactured and sold for farm use, is costly as well as unduly expensive in manipulation, while the larger machine involves an outlay that is not justified by the quantity of grain to be treated by the individual grower. It might be contended, under such circumstances, that a dozen or more farmers should combine and purchase a large grader for their joint use. Unfortunately, the practicability of such procedure is destroyed by the fact that the existence of the bag system would render it necessary to have the grading machine on the farm while the stripper is at work—a thing impossible when it is considered that quite half, if not all, of the proprietors might be engaged in harvesting at the same time. The only alternative that recommends itself is a system of central graders erected at the station of despatch, or, failing that, a large one at port. Were this system adopted, together with

Storage

by means of elevators, instead of the class of sheds now favoured, an effective method of handling grain cheap and expeditiously would be at once secured, while the waste of grain by the ravages of rats, mice, weevils, and other causes would be reduced materially. Needless to say, an undertaking of such magnitude would be beyond the compass of the growers themselves to instal successfully. That, however, is not admitting that the proposal to establish central grain elevators and graders is outside the range of practical application. The co-operation of the Queensland Railway Department would remove the principal obstacles that lie in the way, and that without any loss to the taxpayers of the State. In joining such an enterprise, our Railway Department would not be departing from what is reasonably regarded, in all progressive countries, as the recognised function of all large carrying companies and Governments whose railway system penetrates grain-producing centres. Just recently the Central Argentine Railway Company erected an elevator system in connection with its lines at a cost of £340,000, while in the United States of America and Canada (the home of the elevator) the State and private railway companies would consider a railway in agricultural zones without an elevator as incomplete as a Cairns planter would his sugar-field without the kanaka. In the Dominion of Canada alone, 1,015 elevators have been erected with a capacity ranging from 3,000 bushels up to 550,000 bushels each. Enjoying such excellent facilities for the receipt and storage of grain, there need be small wonder that these formidable competitors in the supply of the world's breadstuffs are enabled to complacently regard the rivalry of this less fortunate State, where neither the science nor experience of modern times has been seized upon for the efficacious production and handling of our grain. A brief study of rural economy affords ample scope for reflection. The bag bill of the Queensland wheat-growers totalled about £11,600 last year. Add to this £5,800, the cost of double cartage, storing, stacking, and weighing paid to Brisbane grain-handling agents apart from commission, and we find a sum of £18,400 of hard-earned money wasted in useless labour and unnecessary expense that might be avoided by instituting modern appliances in the handling of our products. Unfortunately, this does not end the chapter of our improvidence, and we are still left to contemplate the disadvantages and loss arising from the uneven condition of grain offered for sale

and an uncalculated loss from the disastrous depredations of weevils, rats, and mice. To recapitulate, a probable sum of £20,000 might be set down to cover the cost and loss from the present methods of handling grain on our Queensland railways. The figures estimated are on the cost of handling a crop of 1,500,000 bushels. To put the whole of the year's production through elevators would, on the basis of Canadian estimates, involve an outlay of £40,000 in their construction by the railway. Allowing, however, that it cost double that sum to erect them in Queensland, and that the Department charged the former the rate of 5 per cent. on their cost for the use of them, he would escape with a payment of £4,000 per annum as against a present loss of £20,000 incurred by the mode now existing. On the other hand, the railway would perform its services more expeditiously and with less outlay and greater economy in rolling-stock. In making this proposal to the Conference, I repudiate any charge of a desire to solicit Government charity. I claim that what is demanded is no more than any enterprising railway company is prepared to perform and is performing in other wheat-growing lands. Let the Railway Department of Queensland provide a service equipped with modern methods which aims at sweeping aside the embargo that separates the producer from the consumer, and an impetus will be given to Western settlement and production that will reflect its wisdom and increase its earnings.

Transport.

Railroad men everywhere have come to recognise the fact that terminal facilities form an integral part of successful freight handling. Reduction of wasted power and expenditure of time make for smaller freights and larger profits to the producer. The question of transport enters largely into the life of the wheat-grower. Annihilation or stimulation of interior industry and settlement depends quite as much on the good administration of the Railway Department as on the Agricultural Department and on the administration of liberal land laws. To place his product at the ship's side to-day, it costs the average Maranoa wheat-grower over one-third of its full selling value. Tram lines into settlements at a distance from trunk lines would help materially to reduce the cost of haulage by teams, whilst at the same time they would not compensate for the excessive freight charged by the Department to the seaboard. The Canadian Railway companies carry and deliver a bushel of wheat 990 miles for 10 cents (5d.), while for less than one-third that distance 9 cents (4½d.) is asked of the Queenslander to shunt it on to a siding in Roma street, in Brisbane. The time of this Conference is too valuable for me to continue these questions at greater length. I hope sufficient facts and figures have been enumerated to demonstrate the disadvantages suffered by the wheat-growers of Queensland compared with growers in other countries. If I am correct in this surmise, the good sense of the delegates may be trusted to arrive at a satisfactory conclusion whether these disabilities are calculated to encourage men to engage in agricultural pursuits under such uneven terms, or to say if the time has not arrived when larger opportunity should be given the people of this State to occupy the hundreds of thousands of acres of first-class wheat lands now lying idle in the interior of this State, and which yearly, because of the growth of noxious weeds and prickly pear, are becoming a liability instead of an asset to Queensland.

Mr. D. MacBrair, of the Runcorn and Sunnybank Agricultural Society, then delivered the following remarks on—

THE MARKETING OF QUEENSLAND PRODUCTS.

[By D. MacBrair.]

It is a fact well recognised by every thoughtful observer that, during the last few years, a radical change in the social and economical condition of this State, if not of Australia, has gradually taken place, and is still in progress. These changes have resulted somewhat disastrously for those who, either from want of foresight or power of adaptability, have been unable to suit themselves to the altered conditions. The expenditure of loan money, and the spirited works policy of which it formed a part, enticed a host of highly-paid artisans to our State, and also attracted a large portion of our rural population to the capital and other large centres where these works were being carried on. Consumers were many and growers were few, and these few readily sold all they produced, locally, at highly remunerative prices. There was no incentive, because there was no necessity, to seek an outside market. But the expenditure of loan money, though pleasant and profitable whilst it lasts, cannot go on for ever, and now that it has practically ceased a large number of these skilled workers have been thrown on

to the general labour market, so that men who, a few years ago, were earning substantial wages are now competing with the very lowest class of labour for the scantiest pay.

Again, federation, by throwing open our markets to southern competitors, has played havoc with local manufactures, so that not only employees but employers and their families have been forced back on to the land for a livelihood. The cutting up of our large estates has also attracted a number of farmers from outside the State; so that from these three causes—loan money out-of-works, federation out-of-works, and imported farmers—we have settled upon the land such an army of producers as to completely swamp the local demand. The question then arises, How are we to dispose of our marketable surplus—a surplus which every favourable season increases by leaps and bounds? A limited amount might certainly be disposed of locally by more up-to-date methods of distribution; but for the general producer the world's market remains his only outlet, and the problem is, How and where can we place our exportable surplus to the best advantage? It must be conceded that the methods of distribution hitherto in vogue have not yielded satisfactory results. The time-honoured plan of consignments to agents or brokers has proved in too many instances a delusion, a cheat, and a snare. In proof of this, I will give a few instances. The first relates to the Wynnum fishermen, and is culled from a newspaper report a month or two since. It is a meeting of fishermen held at Cloherty's kiosk, Wynnum, to consider what steps could be best taken to improve the present conditions under which their fish were disposed of in Brisbane. There is a full meeting. Mr. Davie, chairman, gave an account of their trouble. It is the old, old story. The present arrangement, he said, was all against the fishermen. Three hours after the fish were caught they were refused as bad. There was sufficient evidence in this, he said, that something was wrong. He instanced a case where a fisherman sent ten baskets of fish to one dealer and eight baskets to another. Both consignments were out of the same boat, and were part of the same catch. Yet one dealer—and the one who obtained the smaller consignment—refused them as bad. The other dealer paid for the bigger lot as good fish. The men now controlling the market limited the supply of fish sent to the city. When good hauls were made, quantities of fine fish, quite fit for food, had to be thrown overboard. Meanwhile the Brisbane public were wishing for fresh fish, but could only obtain what had been kept in cold store. The second instance I wish to give you relates to fruit. A neighbour of mine last season shipped about forty cases of oranges to Melbourne for disposal through the regular recognised agency. When shipping, he gave instruction that two of these cases were to be forwarded, one to each of two friends. I may say that my friend obtained three first prizes at the Queensland National Association's show last year in competition with the North Coast and other districts. In due course he heard from his friends, who each stated that the fruit arrived in splendid condition and had afforded a genuine treat. He also received account sales from the agent, stating that the oranges arrived in very bad condition—the net returns, after paying all charges, amounted to some few shillings. And now, at the risk of wearying you, I should like to give an experience of my own; this time in the home market. In 1882, I took a trip home, and a friend engaged in the pearl-shell trade suggested that I might make a portion of my expenses by a little speculation in his line. So I purchased fifty cases of a leading brand, warranted in perfectly sound clean condition. The outlay was, if I recollect, about £800. Cost of freight, insurance, &c., &c., was about $1\frac{1}{2}$ or $1\frac{3}{4}$ per cent. I placed the lot in the hands of a firm of Mincing lane brokers, of undoubted standing, and reputed to be the leading house in this line of business. The shell was sold at the next regular pearl-shell sales, and the account sales duly came to hand. The prices realised showed a handsome advance on invoice cost, amounting on some grades to 50 per cent., and I thought a handsome cheque was in store for me. But alas! and alas! On totting up the weights of the various lots into which the shell had been sorted or graded, and comparing the total with the original weight, I found a grievous shortage. Then, on studying my account sales, I found a deduction of some hundredweights for dirt, a further deduction of some hundredweights for samples, a long list of charges for every possible and impossible service; and, to cut a long story short, instead of a handsome cheque to the good, I was brought out about £135 to the bad on my original outlay. My reflections were somewhat after this style: Well, the sharks in Port Jackson are bad enough, but they are nothing to those on the Thames. Having occasion to visit Birmingham some weeks later, I called upon a few pearl button-makers. I may mention here that the Thursday Island shell is unsuitable for the Sheffield knife-handle trade, and is used for pearl buttons, which are made in Birmingham.

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I showed them the original invoice, also the prices realised at auction and the account sales. They saw clearly how I had been victimised; but they saw also that there was room for them to buy, and for me to sell to mutual advantage, and they asked me to call upon them should I bring home another lot. But what about the grading, I said? Oh, that need not trouble you; we will use what we can, and sell the remainder to someone else whom it will suit. However, I have not been home since, and have not, therefore, repeated the experiment. So when we read that someone has shipped home first-class honey, for instance, and duly receives an account showing sales at minimum rates, with explanation that the tins were leaking, that the honey had a strong smell of eucalyptus, was too light or too dark, too blue or too green, too old or too young, too soft or too tough, or anything to account for a honey worth £34 a ton fetching only £17, there is no occasion for surprise. Of course it is admitted that some few articles of export figure largely in the open market, as to leave no doubt that fair rates are obtained. Their importance and the interest they command are their own best protection. But other lines, which do not command such publicity, and, therefore, more readily become the prey of manipulators, require other methods of handling, if best results are to be obtained, and it is in the interests of this miscellaneous class of products that these notes are offered. Every commercial man, if he would do a profitable business, recognises the importance of putting his wares on the market in such a way as to attract the attention of potential customers, and of conducting his business on sound up-to-date methods if he would hope to retain them when once acquired. The seller wants to sell, and the buyer to buy. The obligation is mutual; but this mutuality is not always recognised by the buyer, inasmuch as in these days of strenuous competition it has become the recognised province of the seller to pursue the buyer. You have to pursuade him that you have something to sell which it is to his interest to buy, and when you have satisfied him on that point by actual business intercourse, and he finds he can profit himself thereby, he is as ready to maintain the connection as you have been to form it.

The problem for us, then, as exporters of produce, is: How are we to prepare our wares for sale, and how are we to secure and retain a market? So far as our work at this end is concerned, that of preparation, let me urge upon you the importance of sending nothing but the very best we can produce, and maintaining a fixed standard of excellence. Within the range of excellence we may have certain grades of colour, aroma, taste, &c., but it is of the first and last importance that the standard once fixed upon be maintained, and an absolute uniformity and identity characterise all goods sold under the same brand or label. To secure this uniformity is not an easy matter. A large proportion of our exportable produce is contributed in comparatively small parcels, by scattered growers, and quality varies with the season. The most feasible plan appears to be to establish local depôts, to which farmers should forward their produce. In these depôts a proper testing, sorting, and grading should be effected by competent experts, and certain standards and types erected, which, once formed, should be rigidly adhered to. Everything below this standard should be promptly rejected, and any fairly large parcel coming forward, differing somewhat from types already selected, but intrinsically good, might be erected into a fresh type. All produce coming in from the selected area or sphere of operation, and corresponding with the selected types, should be sold under one label. The individual grower thus merges his identity in the general type. On the other hand, he gains by the reputation attaching to that brand, for the more that is sold the more is required. Union is strength. In good seasons he shares with his fellows on equal terms, and in bad seasons, when he has nothing to offer, the brand is kept alive by his fellows, and he can "chip in" again on the best of terms when seasons again favour him. It is, moreover, of the utmost importance that the expert packer exercise his functions with strict impartiality, without fear, favour, or affection; and, having once established his types, adhere to them with absolute inflexibility. Purity of material, cleanliness in preparation, attractiveness in label and decoration, and daintiness in packing are essentials without which no commodities can hope to win their way to public confidence. Reliability in these matters is the only key-note to success.

The second portion of our problem now remains to be discussed—namely, to secure a market. I am unable to offer any suggestions with respect to the East, British America, or the Cape, having no practical knowledge of these markets. My experience is limited to the United Kingdom, where I spent eight years as a commercial traveller, covering large portions of England, Scotland, and Wales, with a few Irish towns. Without the least pretence to dogmatise, I think, if the

task of selecting a sphere of operations fell to my lot, that I should select as my headquarters a large town in one of the manufacturing districts—say, Birmingham, Glasgow, or Manchester, and I should try to form a connection with large consumers, such as manufacturers, caterers, &c., but more especially with the wholesale provision merchants. These latter are a fairly conservative lot, but conservatism cuts both ways, and if they are hard to acquire, they do not readily desert if properly handled. A brand of goods once fairly established in their good graces is sure of a constant market. A second matter to be considered is the choice of a man to act at home as salesman or manager. This is an important matter, and much of the success or failure hangs upon the selection.

Young men are all right as drummers, to beat up business; but where experience and judgment are required, and in a situation where he must act on his resources, a man of maturer years is preferable. I know we in Australia have acquired the habit of parting with our men at an age when older nations than ourselves are only ready to accord them positions of trust and responsibility. You never quite know how a young man is going to turn out. A young manager, or what we call managing clerk, is all right when working under the constant eye of a board of directors, but when required to act alone, and rely on his own judgment, a man of maturer years is the safer investment. It takes a cool head and sound judgment to recognise the psychological moment and seize it.

An expensive establishment should not be necessary, although, for a year or two, a liberal allowance for travelling expenses may be required. There is nothing like the influence of mind on mind when fresh ground has to be broken. Advertising, unless effective, is useless. The late Thos. Holloway, of pills and ointment fame, used to say:—"Advertise lavishly, or not at all; moderate advertising is money wasted." But a regular system of circularisation, persistently followed up, should be a great help. You will probably recognise in all this the usual methods adopted by every intelligent business firm, and the point I wish to insist upon is simply this: that we must treat the matter as a purely business transaction and not expect results different from such as attend any ordinary business enterprise. To produce articles of the best quality and pack them in the most attractive manner is the point which most nearly concerns ourselves as growers. Then, to secure a good man as representative, and generously back him up, is the second and no less important part if we would achieve commercial success.

The Chairman: Mr. W. Deacon, of the Allora Farmers' Progress Association, is down on the programme to open a discussion on the necessity for increased facilities for the export of farming and dairy produce. The three preceding papers may have somewhat anticipated that opening, but they will, at least, give him a very large scope, ranging from wheat to pearl-shell and fish, for the choice of subjects upon which to treat.

Mr. W. Deacon (Allora): I think it will be admitted, from the scope of the papers that have been already read, that this matter of giving facilities for export is a most important one, especially to the wheat-farmer, to the dairyman, and to the fodder-raiser. The Chairman has been good enough to observe that I have a wide field to tread, but I rather think that my ground has been somewhat narrowed by the reading of the three preceding papers. Both the Messrs. Hunter have touched upon some of the subjects upon which I wished to speak. My society has desired me to bring this matter forward, with no idea of hostility or dissatisfaction towards the Department over which you preside. Throughout Queensland we feel grateful to you for what you have already done in advancing the interests of the producer, and especially for what you have done in endeavouring to find markets for their products. (Hear, hear.) You have had established wheat-sheds, which are very valuable and very necessary. I perfectly agree with Mr. Hunter when he says we should have the elevators. He has said something of the elevators in the Argentine Republic, and some of you will remember a full description of an Argentine elevator that appeared in the *Brisbane Courier* of some time back. That elevator cost £340,000. It was erected at the expense of three States, and it is reckoned that, in bags alone, that elevator will save the Argentine Republic 3,000,000 dollars annually. That elevator can load 9,000 tons an hour; but down at Pinkenba, near Brisbane, a wheat ship has to wait three weeks to load. If we are to progress in these matters, I do not see why the Government should not step in and

institute the elevator system. Our Government can borrow money much easier than the Argentine Republic. We have borrowed at 3 per cent., and I believe our 3 per cents are as good as their 4's. Another thing we ought to consider is, the difference in the expense between exporting wheat from Queensland and from New South Wales. The difference is so much that some of our wheat, instead of going to Brisbane for export, has gone to Sydney by rail. The cost of railage to Sydney is more, but the facilities for export in the New South Wales capital are much greater than at Brisbane.

The CHAIRMAN: Did the wheat go down to Sydney for shipment or for consumption?

Mr. DEACON: I think for shipment. These charges are 1d. per bushel, which works out at about 3s. 6d. per ton. Then there are harbour dues on the tonnage of the ships, which increase the freight on the wheat which we may desire to export. When we sent barley to Japan, they charged us 22s. per ton, while America can send flour to Japan at 8s. per ton. How can we compete with other countries under these circumstances? One of the largest of our shippers told me the charges Queensland exporters have to pay really amount to an excise upon the exportation of wheat, and if there should be an excise, I think it should be borne by the general community, and not by the farmer. I can confirm all that has been said about the railways, for on the products that have been dealt with we want some reduction in the railway freights to port. Mr. Hunter has told us of the carriage rates in America—990 miles for 5d. In New South Wales wheat is carried 500 miles for about 5d. per bushel.

Mr. HUNTER: They carry coal 300 miles for 1s. 8d.

Mr. DEACON: They carry iron 190 miles for 1s. 9d. per ton, and I believe coal is carried at one-sixteenth of a penny per mile. Our charges prevent development. Another point I would like to touch upon is the export of butter. I am in a large dairying district, and we there produce nearly 5,000 gallons of cream per week. I am now speaking of the cream that goes from my own particular railway station. In a few weeks that certainly will be doubled, if not quadrupled. There is no fault to be found with the carriage to Brisbane, but there is some fault to be found with the arrangements for the carriage of this butter to London. The shippers want a shipment once a fortnight and a fixed time-table. There is a contract with the Aberdeen line for seventeen shipments a year, which is about one in every three weeks, and the charge on butter to London is $\frac{3}{4}$d. per lb.; and these conditions are imposed upon the Aberdeen Company by a shipping ring. The Aberdeen Company has the ships, but the ring says they must not visit Brisbane more than once in three weeks. The ring says, moreover, the Aberdeen liners shall take no other cargo but butter. For our frozen lambs, other arrangements must be made. I am not an advocate for socialism or for the Government always stepping in, but I think things have gone a bit too far in the way our export trade is being restricted by a lot of people living in London. There were 500 cases of butter sent from Brisbane to Sydney last week, and when it gets to Sydney that butter will be carried home to London at $\frac{1}{4}$d. per lb. If this can be done, surely the Aberdeen line would be in a position, if allowed, to carry it direct from Brisbane to London at $\frac{1}{2}$d. per lb. or even less. I can confirm pretty well all that has been said by Mr. Hunter on the fodder question. I believe lucerne is the best fodder in all the world, and I believe, if it were once introduced into Great Britain, that there would be an abundant market for it. But here again the question of railage stands somewhat in the way. If we could get our lucerne down to Brisbane at 5s. per ton, a great benefit would be conferred upon us. Lucerne should be grown on the Downs, and in times of drought there should be always available a good supply of lucerne not only for ourselves but for the whole State.

Mr. J. M. Hunter (Roma) moved, and Mr. W. Deacon (Allora) seconded—"That, in the opinion of this Conference, the establishment of central elevators and graders are necessary adjuncts to the railway system of Queensland to facilitate and cheapen the cost of storing and shipment of grain."

Mr. E. Hicks (Nerang): I think a good deal of what has been said by the readers of the papers is only too true; but, on the other hand, the farmers of the South are largely to blame for the glutted markets of which they complain. We know very well that we shall not improve our position, even if we do get cheap rates, if we send down rubbish to the market. I am speaking from experience, and feel confident that, if a farmer gets his stuff up in proper style and sends it to the market, he will always get market value for it. Of course, the market is governed by the supply and the demand, but badly got-up stuff has to be carted round the town looking for a sale, and the farmer has to pay for that cartage in the long run. It will probably be found far better to keep your bad stuff at home, and send your good to the public. Give the former to your cattle, and they will grade it for nothing. What they will not eat, put back on your land, and you will get the benefit of it. Many may have noticed the bags of maize that came up the coast with us in the "Wollowra." From inquiries I ascertained that that maize came from Brisbane. Most of you must have noticed that when they began to unload many of the bags started to split and spill the corn all over the hold. When the sender of that maize gets his account sales he will find that there was a tremendous lot of it short, and he will perhaps wonder why, forgetting that it is poor economy to put good maize in bad bags. Until a farmer can improve his methods in sending his produce to market, he cannot expect any improvement in prices. He cannot expect the commission agent to grade his produce for him. In any event, if the agent does grade it, it will be at the farmer's expense.

Mr. W. G. Winnett (Beenleigh) was strongly in favour of the resolution, and he considered that, if the advice on this subject that had been given by the Hon. A. J. Thynne had been carried into effect, the wheat-growers of Queensland would be in a far better position than they are to-day.

Mr. A. Rickert (Allora) said that, in the past, Queensland wheat had not been got up sufficiently well for export purposes. To be able to get a reasonable price for their wheat, even though they did not raise sufficient for their home consumption, they should always be in a position to be able to forward a first-class wheat, of one grade, to the English market; and a step in the right direction to bring about such a state of affairs would be the erection of elevators. He had, therefore, much pleasure in supporting the resolution.

Dr. T. F. Macdonald (Geraldton) and Mr. J. J. Fanning (Townsville) both supported the resolution.

Mr. B. T. McKay (Maryborough) said that, as one of the delegates who had waited upon Mr. Morgan on the question of State granaries, he was quite confident their Chairman would have something to say on the subject; and, personally, Mr. McKay thought that, if it could be shown to the Premier that elevators were essential to the development of the wheat industry, there would be no difficulty in getting them. At the interview mentioned, Mr. Morgan saw exactly what was required, but it was a question at that time whether State granaries would not meet the requirements of the wheat-growers equally as well as elevators. Mr. Morgan had said he was prepared to test the question, and the State wheat-sheds had since been erected in the chief wheat-growing centres. It was apparent, from the remarks of the delegates from the wheat districts, that the granaries, although they had done good service, were not altogether sufficient for the requirements of the producers; and the speaker, therefore, thought it was now necessary for the Conference to pass a resolution affirming that State elevators were essential to the development and success of the wheat-growing industry.

Mr. F. W. Peek (Queensland Chamber of Agriculture) said that the question of grain elevators had been upon the table of his chamber for some

two years, and he was very pleased to see that the representations that had been made to Mr. Morgan and to Mr. Denham had received partial recognition. He had been requested to bring forward every effort to give effect to Mr. Hunter's resolution. There might be more information desired, but they should not be oblivious of the fact that the Department had done good work for the wheat-grower in the matter of the selection of seed, and that at a time when assistance was sorely needed by the growers. His chamber had also in hand the subject of the standardising of grain, and he thought that if they adopted the elevator system they would be able to command facilities in this and other directions which they did not now possess. The assistance the Minister had given them in the matter of the establishment of granaries had had a beneficial, if partial, effect, and would prove to the Government that the means that had been granted to the farmers for making more out of their crops than under the old system had been largely availed of. The growers, however, had still further difficulties to contend with, in the profitable marketing of the crops; and Mr. Peek considered that the establishment of wheat elevators would largely tend to mitigate those difficulties.

Mr. D. MacBrair (Runcorn) suggested that it might possibly be better to encourage the export of flour in preference to the export of wheat, and thereby give employment to a number of men and keep the by-products of the grain in Queensland.

The Chairman: The prime idea in Mr. Hunter's motion is evidently that the bags shall be saved. You will note that the motion asks for a central elevator, and I assume that must be at a port. You are not asking for elevators along the railside?

Mr. Hunter: I would like to see the system tried at the port, and then extended.

The Chairman: Unless there were elevators in the wheat districts, the cost of bags would not be saved. It would still be necessary that the bags be purchased, and when the wheat reached the port it would be emptied from the bags into the elevator. It seems to me that we are seeking to run a long way when, as a matter of fact, at the present time we are scarcely crawling. The total crop of wheat in Queensland last year was only 2,149,000 bushels, and for home consumption no less than 3,500,000 bushels were required. Now, if we had 20,000,000 bushels to export, then it would be reasonable that all facilities should be given for exportation. But when we are importing over 40 per cent. of our requirements, surely the present facilities in the way of grain-sheds in the country should be sufficient. Grain-sheds are erected in the largest wheat districts, and they have proved of incalculable value to the farmer in so far that they have saved him from the expense of erecting his own sheds. They have saved the farmer not only the cost of erection, but they have saved him also expense and anxiety in the way of protection from vermin and fire. The system enables him to bring his wheat to the railway station at any time he chooses—that is, when his time or the roads suit. He is able to place his wheat on the market at a moment's notice, and to send it where he pleases. The great point in the elevator system is quick despathc. The Argentine Republic needs prompt despatch, and I am hopeful of the day when Queensland will be exporting wheat in large quantities, and, when that time arrives, then the easiest methods of handling must of necessity be adopted. But to carry the idea out at present would necessitate our farmers having open wagons. At the stations there would have to be means of pumping the grain into specially constructed railway wagons to take it to the market. At present we can put 500 bags of wheat into any one ship, but under the elevator system that would not be practicable. You must fill the entire ship with the grain. It is all very well to press subjects upon the Government, but you should only press subjects that have immediate and practical bearing. Speaking from memory, I should say that Clifton would be about the only place on the Downs where an elevator

could be profitably erected. Then the farmers have not got out of the idea that if they deliver to your care for storing 2,000 bushels of wheat, they can get those 2,000 bushels whenever they want them. Under the elevator system he can get 2,000 bushels of wheat whenever he wants them, but not the identical 2,000 he entrusted to you. All the wheat that comes to the elevator is blended together, and the farmer simply gets a docket for the amount of wheat he handed in. It rather seems to me that we are aiming at something that is quite out of our range at the present time. The grain-sheds have served an excellent purpose, but if the Conference thinks that the Government has acted wrongly in constructing grain-sheds, then a resolution to that effect may act adversely to the interests of the districts which have not yet got grain-sheds, but which may be desirous of obtaining them. On the question of railway freight it cannot be forgotten that even now there is a large deficit in respect to the management of the railways. Perhaps this year the railways will show a 3 per cent. profit on the capital invested in them. I hope they will, but, even so, such a dividend will still show a very considerable deficit on the interest bill to be paid on the borrowed capital used in constructing the railways. It is all very well for those who are going to get the benefits of cheap railway freights to advocate them, but what about the general taxpayer? Socialism in our time is a very fine thing when it comes in our own immediate way, but there is such a thing as having respect for the general revenue. After all, too, the freight on wheat from Roma is only about 14s. 6d. per ton. I am not averse to the elevator system, and I am not averse to a freight of 2s. 6d. per ton on wheat, but we must bear in mind the circumstances under which we are, and then make our requisitions to the powers that be, accordingly.

Mr. J. M. Hunter (Roma): The question of elevators and graders is one that is generally understood, and I assume most of the people here know the system under which they are worked. I had that fully in mind in preparing the paper I have just read, and my contention is that we have started on the wrong lines. It would have been better to have put up small elevators at the beginning, and got the farmers accustomed to the system. Reference has been made to pushing the sale of flour. Now, I hold, although I am connected with a flour-mill, that this is not the business of a farmer. If the millers of the State are unable to buy the wheat that is produced, through not being able to sell to the Northern consumers, who may allege that the flour is not of equal quality to that which may be procured elsewhere, then that is no fault of the farmer, and no reason why the farmer should not seek outside markets for his wheat. We must not imagine, because Queensland is not producing her own food requirements, that there is no need for export. This year and last year large quantities were exported both to England and Japan, and I contend that it is not essential that we should produce sufficient wheat in Queensland before we try and find outside markets for our grain. With respect to grain-sheds, I hold that the saving is not as real as is apparent. The farmer brings his wheat to the grain-sheds, and has to put it inside, which means a certain amount of time and labour. When he sells it he has to drag it out of the shed. It has to be sent to Brisbane and carted from the railway station there, all of which entails expense. Furthermore, I contend that grain stored in elevators in a loose condition is less liable to the ravages of mice, weevil, and other vermin than wheat stored in bags in grain-sheds. The saving effected in this alone would enable the farmers to pay annually in rent 10 per cent. on the cost of construction, which would be more than sufficient to defray interest and redemption. I am certainly pleased to think that we have throughout Queensland a few sheds for the storing of grain, for sheds are better than nothing; but they do not fully meet our requirements, and I would like to see those districts that have not yet got sheds, given elevators instead. That would be the beginning of a system which must ultimately be adopted. With regard to freights, we know every district considers its freights are not as cheap as they

should be, but when we know that our freights are 50 per cent. higher than those of Canada, and often higher than those of New South Wales, then we can hardly be grumbling if we say it is not a fair thing. Moreover, I claim that the producers require more assistance than they are getting. If it can be shown that a man can go out into the Western lands to-day, and produce wealth for the country, I hold that the Government should give him cheap freights to assist him in his endeavours to develop the State. I sincerely trust that the Conference will see its way to urge this matter upon the Government, for it is one that requires to be urged.

FOURTH MEETING.

Tuesday Afternoon, 16th May, 1905, at 2.30 p.m.

INVITATION TO CHILLAGOE.

The Chairman announced he had received an invitation from the superintendent of the Chillagoe Railway and Mines, Limited, for all the delegates to the Conference to visit Chillagoe, and that passes would be granted over the company's railway.

FRUIT PARASITES.

Three questions were submitted to the Chairman by Mr. W. Smith, the representative of the Border Agricultural, Horticultural, Pastoral, and Mining Society, Stanthorpe, on the above subject. The following are the questions, with the answers thereto:—

1. Have any steps been taken to ascertain the names of the parasites that are now being imported into America by the Government for destroying the codlin moth, and are any arrangements in contemplation by the Agricultural Department for introducing the same into Queensland?

Answer.—This matter has been the subject of correspondence with the United States of America; but, until further particulars are to hand, it cannot be said what action will be taken towards the introduction of the parasites indicated. The investigation of the matter is receiving the attention of the Government Entomologist.

2. Will the Department inquire what has been done by the Agricultural Department of Western Australia in reference to the introduction of a parasite of the fruit fly; and, if the efforts have been successful, will the Department endeavour to obtain a supply?

Answer.—Inquiry has been already made, and a request presented, for these parasites, but the Department of Agriculture of Western Australia are not yet in a position to distribute these parasites.

3. How are farmers in Queensland who want bacteria for inoculating their soils for the growth of legumes, to proceed in obtaining the cultures from our Agricultural Department? Could not the services of Mr. Pound be secured in manufacturing cultures in Queensland, without resorting to America? Could any information be obtained by farmers which would enable them to manufacture their own cultures?

Answer.—The bacteria received from America are not in a form that can be generally distributed, and it is necessary that seed shall be treated in bulk, and at one operation. The bacteria may be applied to the soil, but generally to the seed. The material now at hand is limited in quantity, and is applicable only to peas and clover; but experiments are now proceeding with lucerne and similar crops. The Department is not in a position at present to distribute treated seed. Mr. Brünnich, the Agricultural Chemist, has the question of manufacturing cultures in hand, and it is hoped that before long further information applicable to Queensland, the result of experiments, will be available.

GRAIN ELEVATORS, FREIGHTS, &c.

The discussion on the above subjects was resumed.

Mr. W. Deacon (Allora): I want to say one word in reference to this elevator question. We do not expect the Government to build elevators next week, but we hope they will keep the matter under consideration. When the deputation waited upon the Minister for the purpose of asking for storage facilities, I recollect very well that Mr. Thynne mentioned my name as one of those who were in favour of elevators, rather than grain-sheds. With respect to the cost of elevators, it will be remembered that in the paper Mr. Thynne was good enough to read to us, the cost of a wayside elevator was put down at £800, and this would not be a mere elevator. The ground floor was to be used for the storage of wheat in bags, for those who preferred it that way, and then the elevator was to be provided with machinery by which a man could detach his horses from his wagon and put them to work on apparatus for putting the grain into the elevator. Some of our grain-sheds cost £1,000 each. Mr. Thallon promised us he would put a trial elevator on the Downs, and that was long before the grain-sheds were given any consideration. We do not growl at our railway freights so much, although they are higher than those in New South Wales and in most of the other States, as, for instance:—

Wheat Freights per Ton.

For 100 miles	Queensland	8	9
	New South Wales ...	8	0
For 200 miles	Queensland	15	0
	New South Wales ...	11	4
For 300 miles	Queensland	19	2
	New South Wales ...	12	4
For 400 miles	Queensland	23	4
	New South Wales ...	13	4
For 500 miles	Queensland	27	6
	New South Wales ...	14	6

Mr. Hunter's resolution was then carried.

Mr. W. Deacon (Allora): I beg to move—"That, in the opinion of this Conference, the harbour and other charges on the export of grain, fodder, and all other farm produce are excessive and should be reduced." As said before, our charges are about 3s. 6d. per ton. Such rates on a ton of copper or a ton of wool (and I suppose they are the same all round) might not be excessive; but when it comes to wheat, which is worth about £4 a ton, it is a heavy charge; and when it comes to hay or chaff, it is a heavier charge. I spoke about this charge to a shipper of butter, but he did not consider it a very serious one. On bulky cheap products, however, it is undoubtedly a tax. A penny a bushel is a heavy charge, and is practically 3 per cent. of the total value of the grain. If some arrangement could be made by which these charges could be made *ad valorem*, which is a just way of making a charge, it would be only justice to ourselves, and might, perhaps, produce a heavier revenue than at present.

Mr. J. M. Hunter (Roma) seconded the motion.

The Chairman: It is, perhaps, known to all in the room that each port has control of its own finances. I assume Mr. Deacon is particularly thinking of Brisbane. To my mind export harbour dues are altogether wrong. (Hear, hear!) It is not merely a question of reduction, for I think these charges should be removed altogether, and the import dues raised to a level that would cover the charges of the port. But it is not a matter upon which the Government alone have control, although it is one that is engaging their consideration. I have more than once brought it under the notice of the Treasurer, who is now in communication with the Chamber of Commerce with respect to this matter. Personally, I have advocated all along the entire removal of the

export dues and the advancement of the import charges, so as to make them cover the cost of the up-keep of the harbour. With regard to wharfage, if the stuff passes over a private wharf, then the Government can have no say on the matter. On the Government wharf at Pinkenba, however, I think the wharfage charge is only 1s., as against the 1s. 6d. charged on private wharves. Still, the question of wharfage charges at Pinkenba is one upon which the Railway Commissioner might be consulted, and possibly he might be able to meet exporters in some way.

Mr. Deacon's motion was then carried.

A FRUIT TRAIN.

The Chairman (in reply to a question from Mr. J. M. Hunter, of Roma) said: Quite recently the General Traffic Manager of the Railway Department went to Sydney specially with the object of getting a through rate on fruit from Brisbane to Sydney and Melbourne. The Victorians were agreeable to an adjustment of the rates. Queensland was agreeable, but we were unable to prevail upon New South Wales to so adjust the charges as to make it possible for fruit to be sent through to Melbourne at anything like a reasonable cost. As you are aware, there is a considerable trade done between Queensland, New South Wales, and Victoria in small fruits, such as strawberries; and quite recently a lot of oranges were sent through by train to Melbourne by Mr. Philp, of Grantham. Mr. Philp's experiment was successful, and we thought we would be able to establish a fruit train, with a rate of freight reasonable enough to permit of the fruit being carried right through from Queensland to Melbourne. New South Wales, however, asked such a figure as to make it impossible to carry out the project.

MARKET FOR QUEENSLAND FODDER.

Mr. A. Hunter (Laidley): I desire to move—"That, in the opinion of this Conference, the Government should make inquiries, so that the market for Queensland fodder may be extended to foreign ports where a market may be found." The district I represent is entirely a fodder-producing district, and we are very much handicapped at the present time in the matter of getting at markets. In Sydney, for the last twelve months, there has always been a living price for fodder; but, on account of plague restrictions, we are now debarred from sending to Sydney. Then there is the competition we have in the North Queensland markets from fodder brought from New South Wales. I believe the shipping companies will carry fodder 2s. 6d. cheaper per ton from Sydney than they will from Brisbane.

The Chairman: That is relatively, not actually.

Mr. A. Hunter: I believe there is a market in South Africa; but, owing to the steamers that visit Brisbane having to make Sydney a port of call, we are debarred from sending to South African and similar markets.

Mr. A. Rickert (Allora) had great pleasure in seconding the resolution.

Mr. J. M. Hunter (Roma): I think the present Government should be complimented for having, at least, started in the direction of finding markets for Queensland products. Instead of there being one, however, I think there should be more, for opportunities for a good deal of trade could be found. It was an excellent move to appoint Mr. Jones, and the best compliment that the Conference could bestow on the Government's action would be to ask them to appoint more commercial agents.

The Chairman: Reference has been made to the plague restrictions in Sydney. Unfortunately, Dr. Ashburton Thomson in Sydney is an autocrat. He not merely controls the Department of Public Health, but he appears to control the Cabinet, and their decisions with reference to the Sydney port arrangements. Every effort has been exerted to get an abatement of the unnecessary restrictions that have been imposed, but so far, such effort has failed. We have been free from plague for many weeks, but they have had

plague badly in Sydney, and it was only yesterday that I noticed the report of another death from plague there. Yet they still impose restrictions on produce from Queensland. It would be quite easy for us to resort to retaliatory measures, but that would stultify our arguments. We have always said that there is no occasion whatever for the restrictions which have been imposed, and, if we now impose restrictions, it would be really stultifying the position we have previously taken up. Melbourne right through has done nothing other than ask that the ships be fended off from the wharves 4 feet, and that is our position. We only ask ships to fend off the wharves 4 feet. The most absurd thing about the Sydney restrictions is that, even though produce may be consigned to South Africa, and is not even taken out of the ships at Sydney, such ships are forbidden to call at Sydney, which practically means that we are forbidden to ship produce to South Africa. The 50 tons of malting barley that we sent to London as a trial consignment, to test the English market, had to be sent overland to Sydney. The Premier guaranteed that the barley should go straight from railway to ship's side, and be slung from drays into ship's hold, and thus practically not be landed in Brisbane; but the Sydney authorities declared that if the barley even passed through Brisbane, the ship that carried it away from Pinkenba could not call at Sydney. So it will be seen that, in dealing with people who are so unreasonable, it is difficult to get any satisfaction out of them. The matter is still a live one, the Premier is corresponding with the Premier of New South Wales—the issue of which is unknown to me. With respect to the question of the shipment of fodder, we seem to forget that we are 17,000 miles away from the English markets, and that a ton of chaff pressed in the best way we can press it here measures no less than 200 feet, and occupies a space of 5 tons of cargo in a ship, although the shipping companies meet exporters to the extent that they only charge for 3 tons. The freight to London is 25s. a ton, which means three times that for chaff or £3 15s. a ton, and I do not think any fodder that we can grow can stand that freight. I sent 5,000 bales of Dedrick-pressed lucerne hay to South Africa. It was taken at $3\frac{1}{2}$ ship's tons to the ton dead weight, it cost me over £4 a ton to send it. I did not get 5,000 farthings for the consignment. The return did not cover freight. There is only one way to reach those parts, and that is to send the fodder in the compressed form in which the samples on the table are put up. I do not know how the samples came here, and they did not come at my instigation; but I see by the pamphlet which accompanies them that fodder compressed in the form shown here can be shipped to South Africa for 30s. a ton. The fodder is said to be so compressed that a ton of it is reduced to 40 cubic feet, thus enabling a ton of it to be shipped to South Africa for the ordinary charge of £1 10s. There does not appear, by the pamphlet, to be a company operating in Queensland which handles the fodder.

Mr. Deacon: Are they going to handle it here?

The Chairman: If they can get people to take up shares. Messrs. Aplin, Brown, and Crawshay appear to be the Brisbane agents. There is a market in South Africa for fodder if you can send it in that compressed form. But there is no market in the East. My advices from Mr. Jones are to the effect there is practically no market in the East for those lines. The alternative way to dispose of your fodder is to put it into fat lambs or into the milking bucket. I was told not long ago, by a gentleman in Pittsworth, that he was raising five lambs off 1 acre of lucerne. A Gatton farmer near by immediately said that he could manage fifteen lambs on 1 acre of his lucerne. If a man can do that, he does not want to bother himself with lucerne hay or chaff. If that is the condition of the Lockyer Valley, we do not want to worry our heads about the English market for fodder. That does not in anywise prevent your resolution from being carried, for it will strengthen my hands in asking the Cabinet to find further markets for your produce.

The resolution was then carried.

THE RESOURCES OF THE KILLARNEY DISTRICT.

[By G. A. Ball.]

The associations that I have the honour of representing are those of Killarney, Tannymorel, and Danderoo. The latter association is probably known to many of you, as it has been represented at some of your previous gatherings by Mr. Atkinson, the poultry fancier. The other associations are only of recent formation, but they are both very much alive, and are doing really good work.

Killarney, as you are aware, is distant some 197 miles by rail from Brisbane, and is situated at the terminus of a branch railway line from Warwick, which township is 27 miles distant. Tannymorel and Danderoo are also on the aforesaid line, but are respectively 4 and 6 miles nearer to Warwick than Killarney. We are bounded on the south and east by the New South Wales border, which is only 3 miles away from the Killarney Railway Station. To those amongst you who have never had the pleasure of travelling by rail from Warwick to Killarney, I can safely say that you have missed undoubtedly the prettiest piece of farming country in the whole of the Commonwealth, and, besides its pleasing appearance to the eye, it is unquestionably the most fertile corner of the famous Darling Downs (the garden of Australia). The soil is wonderfully rich, and capable of growing almost anything in the way of agricultural products. The country is well watered by the Condamine River, Spring, Farm, and Emu Creeks, sources of water supply that were equal to the great drain caused by the drought of 1902-3, the like of which had never been previously experienced in the history of Australia, and it is to be sincerely hoped will never occur again.

The paper that I will trespess on your good nature to listen to will be one treating, as briefly as I possibly can, with some of the magnificent resources of the district which I have the honour of representing, and which is generally known as the Petty Sessions District of Killarney. Permit me to state at this juncture that this district is the only one known in Australia that can, within such a limited area, successfully engage in dairying, and also wheat, maize, barley, lucerne, and tobacco growing.

Dairying.—Although the infant of our magnificent group of great industries, it is, in my opinion, destined to become our greatest. The drought forced the farmers here to realise that it was not advisable or desirable to be entirely dependent on a crop which perhaps may never grow, owing to absence of rain at the time most needed, and may, when ready for harvesting, be destroyed in a few minutes by a hailstorm, said hailstorms being not uncommon during the wheat and barley harvesting seasons. This being so, dairying, in conjunction with cultivation of crops, was tried, and the result has proved highly satisfactory, and the general verdict is that dairying is the best thing that has been tried. Our rich hillside scrub lands grow an abundance of valuable fodder, and the grass best suited, amongst those tried, is undoubtedly prairie, which commences to spring about March, is at its best during the winter (when it will easily carry a beast to the acre), and will last until November, when it commences to die off, but even when dry is still good feed for dairy stock. Lucerne will also do fairly well on the hillside scrub farms, but it is seen at its best on the rich river flats, where it flourishes, wet or dry, as soon as it becomes properly established. One practical instance of the value of lucerne for dairy stock will be sufficient to quote. A Mr. Carey, who has 11 acres under lucerne (4 of which are reserved for his pigs), and pratically not a blade of grass in his paddock, was forced to consider whether it would be better to turn his cows out, or feed his green lucerne to them. He decided on the latter course, with the result that during February, 1905, his actual returns from 13 cows for cream supplied to the Warwick Butter Factory were £18 17s. 3d., or an average of 7s. 3d. per cow per week, and he informed me that his returns for March were even better. In addition to the 7s. 3d. as above, he had the skimmed milk for his calves and pigs. I venture to predict that our district is destined to become the best dairying centre in Queensland, if not in the Commonwealth.

Wheat.—This is our principal crop, and the returns for our district are by far the highest throughout the Commonwealth, reaching as high as an average of 36 bushels per acre for the district in 1901. The quality of the grain is equal to that of the other States, as has been clearly demonstrated by our wheat being quite able to hold its own in the world's markets. The principal varieties of wheat grown in this district are—Budd's Early, Marshall's No. 3, Defiance,

Manitoba, Gluyas, and Pugh's Prolific. The cost of cultivating and marketing is approximately as follows:—

	£ s. d.	
Ploughing, harrowing, planting, and seed	0 8 0	per acre
Cutting, stooking, carting, stacking, and threshing	1 5 0	,,
Bags and cartage to station (say 2 miles)	0 7 0	,,
	£2 0 0	,,

A crop of 9 bags to the acre, at 10s. per bag, would mean a return of £4 10s. per acre.

Maize.—Next in importance is the maize crop, and the yields from our rich scrub lands and rich river flats compare very favourably with any other part of the Commonwealth, and it is very rarely indeed that this crop fails us, which is ample evidence of the productive power of the soil. Our grain is also credited with being almost entirely free from weevil. This season's crop is now being gathered, and although the climatic conditions could only be termed medium, yet many of the farmers are getting 12 bags to the acre, and the present price is about 8s. per bag. This may be considered only an average crop, as 80 bushels (or 20 bags) per acre have been frequently obtained.

	£ s. d.	
Average cost of ploughing, harrowing, planting, weeding, and seed	0 10 6	per acre
Average cost of pulling, cartage, threshing, and bags	1 0 0	,,
	£1 10 6	,,

Returns, 12 bags to the acre, at 8s., £4 16s.

This crop is more in favour than wheat, especially with farmers who have large families, as very little labour is required to be paid for. The harvesting can be extended over a fairly lengthy period, whereas with wheat it should be got in as quickly as possible after ripening.

Barley.—This is a most prolific grower, and yields of 48 bushels per acre have been frequently obtained, and the value of our grain for malting purposes is beyond all question. Yet, the maltsters are so few and far between that the growing of barley in this district is likely to become a thing of the past. Pity is that it should be so, but, when growers cannot dispose of their product, it is time for them to turn their rich lands to some other purpose, and dairying will probably supersede what should also have become a profitable industry.

Lucerne.—This crop has only received attention here during the past two years, and there are very few farms indeed now that have not a small patch of this valuable fodder, the qualities of which have already been referred to under the heading of dairying. Sufficient will it be to say here that our rich river lucerne flats, at present worth from £10 to £20 per acre, are quite equal to the famous Hunter River flats, which run in value from £50 to £100 per acre. Six to eight cuttings per annum can be obtained, with an average yield of about 1 ton of hay per acre per cutting.

Tobacco.—This once flourishing Killarney industry, which enabled the growers to pay rentals of £4 to £5 per acre per annum, was practically crippled by the formation of a tobacco-buying ring. The average yield of leaf per acre is about 10 cwt., and this, at the low price of 3d. per lb., leaves a handsome margin.

Potatoes, Onions, and Vegetables.—Splendid returns are obtained from their cultivation. A ready market is found for these products in Brisbane.

Fruit.—The cultivation of stone fruits does not seem to have met with success here. The soil is generally admitted to be too rich, besides which the fly is very much in evidence. Grapes are, however, an exception, and magnificent returns of beautiful fruit are obtainable.

Honey.—The apiaries number half a dozen, and although only a very minor industry, our honey is capable of holding its own in any show-building in Australia, as is proved by the prizes won at various exhibitions by our apiarists.

Sisal.—No attempt has yet been made at cultivation of this valuable plant, but, judging by the way odd plants have grown here, there should be undoubtedly a great future for it.

Timber.—Leaving our agricultural industries, let me turn to our district's most valuable product—viz., timber. It is pretty generally admitted that Killarney and Tannymorel are second to none with their timbers. We have almost inexhaustible supplies of beautiful white hoop pine in our mountain scrubs, excellent for building purposes, and now becoming very much in favour for butter

boxes. The foolish prejudice that existed amongst our butter men has almost reached vanishing point, and when the Killarney-Boonah Railway (for which there is rightly a strong agitation) is obtained, then I venture to say a magnificent State asset will be opened up and placed within 80 miles of Brisbane. About 38 miles of railway line, from Killarney to Boonah, will form the connecting link between Boonah, Adelaide, and Longreach. Although only 100 miles from Brisbane, to get there we have to travel 197 miles around by Toowoomba. We have all sorts of most beautiful hardwood, and Mr. Hamley, roads engineer, in charge of the mountain road cutting, midway between Killarney and Boonah, states that he has come across thirty different varieties of most excellent milling timber in our scrubs, and that our mahogany is equal to best jarrah for railway sleepers, and he should know, for he has had nine years' of railway experience in Western Australia. Six sawmills are at present in operation in our district, and, in addition, log timber is supplied to Warwick, Allora, Clifton, Toowoomba, Gatton, Laidley, &c.

MINING.—Our only form of mining is that of coal, and rich seams of an excellent quality are plentiful, but, so far, only one seam is being worked, and that in a somewhat primitive manner. There are rumours that a company is about to take over this property and extend the operations. Some preliminary work has also been done on another seam, within 1 mile of a railway siding, and capital is expected to be forthcoming for its development very shortly.

PASTORAL INDUSTRY.—Cattle-raising only is gone in for. With the exception of the lucerne flats, the country is not suitable for sheep. Stations on the Queensland side are practically a thing of the past, but on the New South Wales side we have a few stations whose natural outlet is through Killarney.

CLIMATE.—Killarney is generally recognised as the best health resort in Queensland, the crisp mountain air being very bracing, and much appreciated by those who live near the coast. Our district has many attractions for tourists, as there are many sights of interest, mountains to ramble about on, and excellent fishing and shooting.

The CHAIRMAN said that yesterday Dr. Macdonald had talked about the North as being the Garden of Eden, but the garden, judging from Mr. Ball's paper, must have been somewhat about Killarney.

Mr. W. DEACON (Allora) thought it was an excellent paper, and one that could have been written about a dozen other places on the Downs.

Dr. MACDONALD (Geraldton) said that, according to some of the figures given, it appeared that some of the land in the Killarney district could produce about £4 5s. an acre annually. He could assure Mr. Ball that on the Johnstone River a good deal of the land was fetching an annual rental of £2 per acre.

Mr. J. G. FEARNLEY (Cairns) said that it was apparent the Herbert and Johnstone Rivers districts were the front portion of the Garden of Eden, and Killarney the back or possibly the kitchen garden.

Mr. BALL was pleased to hear of the high rentals earned by land on the Johnstone River, but he might say that the same rates ruled for a good deal of the maize and lucerne land on the Condamine Valley.

Mr. W. KEYS, of the Darling Downs Pastoral, Agricultural, and Industrial Association, Clifton, then read the following remarks on—

DAIRY CATTLE.

[By W. KEYS.]

The new beginner should choose the best cows to be got within his means, whatever dairying strain he may decide upon. Always go for the breed you fancy, not forgetting to give other breeds a trial, because they may suit you better than the one you may fancy. It all depends on the sort of farm and grass you have. If you have a large place with plenty of good feed, the large cattle may suit better; but if your farm is small and the soil of good quality you will find that small cattle, such as Jerseys or Ayrshires, will do better. I would recommend Jerseys, as they yield more and better cream than any other breed. Cows of small size and such as are easily fed will live and milk in bad seasons when the larger cattle would die. They are very gentle and kind, and easy to work with. The next thing to be chosen is your bull, which is the most important of all. Some persons think if they have a bull it does not matter what sort he is, provided he suits the purpose he is intended for.

But that is a great mistake. You should be very careful over the choice of your bull. If you are not a judge yourself, you should get a person who is, to pick one for you. It will pay you in the end. Giving a large sum of money for a bull may appear to be a waste of money, but you are well repaid in two years by the quality of your young heifers in the first place and in the quantity and quality of milk in the second. All your young stock is the progeny of the bull. If he is good, so are your calves. If he is inferior, your calves are inferior, and your coming herd will be spoilt. If you breed from a bad cow you lose only one calf in the year, but it is very different in the case of the bull, as all your calves are his.

The calves are next to be considered. Most people take the calf from the mother as soon as it is dropped. I do not approve of that. The cow's milk is not fit for use for some four or five days after calving. Then why not let the calf have the benefit of the mother's milk, as it was intended by Nature to have?

I never take the calf from my cows until a week has elapsed. I bring my cow and calf in twice a day, take from the cow what milk the calf cannot consume, and then let the calf out with her again. By doing this I get my calf quite strong, and it is, therefore, much easier to rear. The cow, when she has the calf with her, will go away and feed, and get strong, instead of lying at the calf pen all day and night, as is often the case. When giving the calf its first meal, tie it near the cow's head, milk the cow, take your calf bucket, put in a portion of the new milk that you have just milked from the mother, and feed it before letting the mother out of the bail. The calf is anxious to get to the mother, and will drink freely with a little start with the fingers, slipping them from the calf when it is taking in the milk freely; it will then drink by itself. Your cows should be driven very quietly to the yard, and allowed to stand for some fifteen or twenty minutes before you begin to milk. A cow is excited when she comes into the yard, and will not give her milk freely if started the minute she comes in, nor will her cream be as good in test.

Dairying on the Downs.

I have had much experience in dairying in New South Wales—on the Richmond River and in the Illawarra and Bega districts. I never saw cows milk better in any of the places mentioned than they do on the Darling Downs. I average over £1 per month per head from my herd. Last month I received from the factory £40 for the cream yielded by thirty-six cows, which, by the way, were not stall fed. I had very little grass, owing to a spell of dry weather. Lucerne cut, carted, and spread on the paddock was the only feed they got. I consider that Queensland is one of the best dairying States of the Commonwealth, with its vast stretches of good rich land, which can be ploughed and placed under large areas of fodder, such as lucerne, sorghum, and corn for summer feed, and barley and oats for winter. With factories everywhere within reach and hand-separators, there is nothing to prevent dairying being carried on in any district of the State. Some may run away with the idea that dairying will be over-done. There is no danger of that if only a good article is made, as the London market will take it all. The more we make, the bigger the market that is open for us. I might mention that my cattle are all Jerseys. I was told when I brought them to Queensland that they would die in the winter with the cold; but they have done well, and I make more money in the winter months than I do in the summer.

Treatment of Cream.

As soon as your cream has been separated from the milk it must be cooled down, and not allowed to stand in the cream-can for a day or two without any attention. Two hours after separation, your cream should be well stirred. If not, your cream on top will thicken, a close-formed scum of cream preventing the animal matter or gas from escaping, which causes your cream to ferment and get tainted by the gas. Once tainted, no factory manager can make good butter from cream allowed to ferment.

The Chairman thanked Mr. Keys for a straightforward, terse, and clear document, and asked Mr. N. McKenzie, of the Combined Moreton Association, for his paper on—

COW CULTURE.

[By N. McKenzie.]

The leading question of the day in all lines of business seems to be the one of financial success.

This is, be it right or wrong, a money-getting age, and not a whit behind his commercial or professional brother stands the tiller of the soil, experimenting with grains, grasses, and fruits, with a view to their more perfect development

and increased fruitfulness; also, more important, comes the live stock department on the farm, and herein lies one of the surest sources of income.

The stand-by of the farmer is the milch cow. She need not and does not interfere with other branches of farming, and she supplies a revenue more surely and with less variation than any other source of income.

In Queensland there is a marked progress in this industry during the past few years, and few who are not directly engaged in handling dairy products have any idea of its present magnitude.

With the education that has come to our farmers through the efforts of the Department of Agriculture, there has been no industry developed in the State whose progress has been so rapid.

While this is true, and while our foremost dairymen, by constantly striving to raise the standard of production, now have excellent high-yielding herds, it is unquestionably a fact that a large number of our cow population are not paying for their keep.

The cause of this is to be found either in the man or in the cow, or, perhaps, in both, as Queensland with her wealth of suitable fodder and mild winters furnishes, ready-made, is a territory nowhere excelled for suitable dairying.

But brains in the man and blood and feed in the cow are essentials to the success in Queensland as elsewhere, although here Nature has seemed to be most lavish in her beneficence.

If the man behind the cow in Queensland would do his part, no unprofitable animal would be kept on the farm. She would either go to the butcher's block or be made to return a profit by more intelligent care and management. So long as cows of this class are permitted to remain in the dairy herd, so long will there be dissatisfaction and failure.

Improvement is the route to success, whether by breeding, better management, or other ways; and intelligence in our cowmen is the power that will force the advancement in the right direction.

Dairying, rightly conducted, is one of the surest money-makers of our varied industries. It is incomparably more rational than any one-crop system, as it affords steady employment with returns remunerative according to the brains mixed with the business.

The spirit of education is abroad in our State, and the Department of Agriculture is to be congratulated on the issue of an instructive and intelligent pamphlet recently issued in connection with the Dairy Bill.

The information it contains covers the best modern thoughts of well-known authorities upon the respective topics treated, and is intended to be of practical benefit to our farmers and dairymen, as well as to promote the prosperity of our creameries and cheese factories—the interests of all these being inseparable.

By studying the contents of that pamphlet, dairymen will see the advisability of observing certain sanitary and other precautions in the production of milk, in order that the output, in whatever form, from the cow to the consumer, may be the most wholesome possible.

To be a successful dairyman, one must have a liking for farming in general.

To operate a dairy farm successfully, it must be profitable; and, in order to be profitable, there are a few absolute essentials, and I consider the first of these an intelligent dairyman; the second is the right sort of cow; and, where these two are found together, the third essential—the feed—is very apt to be found and given in the proper proportions.

It matters not what breed of cow is selected from among the milking strains; a dairy cow's business is to consume food and convert it into milk at a profit.

There should be no guesswork about the dairy business; but by a carefully kept record the dairyman should know just what each cow is doing. It takes but a short time at each milking to weigh and record the milk of each cow; and by taking a sample of night and morning's milk a few times a month, and testing it with the Babcock tester, one can determine very closely the amount of butter fat his cows are producing.

The sorting-out process should begin early—the weeding out of cows that for one cause or another prove undesirable or unprofitable. Set your standard high for flow of milk and test for richness, and continue to work towards that end, and you will find greater pleasure as well as profit in your herd.

It is success that encourages, and, as the returns for the dairy come in, the character of the buildings about the farm improves, a general air of prosperity predominates, and the farm and home become more attractive.

There is one drawback, one worry, for the man who owns the cows, which causes him more anxiety than all others, particularly if he has a large herd, and depends upon help outside his family for milkers; and that is, the labour question. It is very hard to secure good faithful milkmen who are patient, kind, and thoroughly interested in their work. Still, this difficulty is likely to be got over by the milking-machines that are now being introduced into the State.

Mr. Chairman, there is nothing, aside from the milk of human kindness, so necessary to the comfort of any family as the milk of a good cow: It is like oil poured upon the waters of life; it is a perfect food for the baby; it is an excellent beverage for the children; it furnishes cream for the coffee, butter for the bread, and cheese for the lunch; it shortens the pie-crust and raises the johnny cakes; even the cats and the dogs cry for it. With the farmer it goes still further: It raises the calf; it feeds the pig; it pleases the colt; and it delights the chicken. Yes; and, if he will only give her a fair chance, the cow will clothe the children, buy comforts for the wife; pay the taxes, and help to lift the mortgage if there is one. Therefore—

Give to the lordly steed his equine grace;
Give to the farmer large reward for his toil;
Render to the milkman all honour due to his place;
But bear in mind—the cow is mistress of the soil.

Mr. W. Palmer, of Bowen, moved the following resolution:—"That this Conference recognises the value of introducing good dairy bulls into our herds, and it strongly urges the Department of Agriculture and Stock to give every facility to farmers to obtain the benefit of the dairy bulls at present at the Agricultural College at Gatton or other Government institutions."

Mr. E. Swayne (Mackay): We have hitherto, in the Mackay district, experienced many disabilities in the way of procuring purebred cattle, although it is a question we have devoted a good deal of consideration to. When Mr. Kidston was in Mackay the other day the matter was brought before him, and what was suggested was, that one method of distributing the purebred bulls from the Government herds would be to donate them as prizes in the dairy cattle classes at the various shows. I think that some years ago your Department did do this, but only for one year; and I know it has been suggested, by more than one, that the practice should be again resorted to. The fact of the bulls going to the owners of prize-winning animals would mean the bulls getting into the hands of men who would be able to appreciate and take charge of them.

Mr. A. Hunter (Laidley): I am in great sympathy with the motion; but, in the matter of bulls, the great difficulty we have is that of straying mongrel bulls. We have no redress for the damage done by these vagrants. If we impound the animals, we get into bad grace with their owners, which, of course, in the country, is a state of affairs no one cares to rush into. There should be some law with regard to the owners of these mongrels, and the onus of putting it into effect should not lie with the farmers.

Mr. T. Tennison (Kilkivan): I cannot sympathise altogether with the last speaker's grievance on the subject of what he calls mongrel bulls. The district I come from is a dairying one, but still there is a lot of country which is not adapted to the keeping of dairy cattle, and consequently the settlers have to go in for the rearing of cattle intended for fattening purposes. Those people find the Hereford, which is almost useless for dairying purposes, one of the best of the fattening breeds. I admit it is very hard if a man has a herd of dairy cattle, and a Hereford bull gets amongst them; but it would be also hard for the owner of a valuable, and probably purebred, Hereford bull to have that animal impounded for straying. In fairly sparsely populated country, where the cost of rearing cattle has to be kept down to a minimum, it is impossible to keep bulls from straying and occasionally getting in among other people's herds.

Mr. W. G. Winnett (Beenleigh) pointed out that, under the Local Authorities Act, power was given to impound straying bulls, and to claim compensation for any damage they may have done. Still, although the question was a very

serious one, very few would care to take those measures. He thought some more effectual way might be devised to overcome the difficulty.

Mr. H. Heinemann (Redland Bay) also stated that those who suffered from straying bulls had their remedy in the pound-yard and the £5 damages which the law allowed them. Of course, if a man did not want to offend his neighbours, he had no remedy. The Act, however, was there, and should be quite sufficient for all requirements.

Mr. W. Keys (Clifton) said his method of dealing with the matter was always to keep his bull on the rope. He got better results by the system and on half of the feed.

Mr. T. E. Coulson (Rosewood) thought it should be the duty of the Government to keep a record of the milk production of the families of the bulls they intended to offer to dairy farmers. Mr. Coulson had been at the first Agricultural Conference at Gatton in 1897, and there the Hon. A. J. Thynne outlined the idea of presenting bulls as prizes at agricultural shows, an idea which had that day been alluded to by Mr. Swayne. Competitions were held shortly afterwards for bulls presented by the Department, and one of the animals came to Rosewood. He was a very good animal, but the people of the district did not avail themselves of his services as much as they might have done. Mr. Coulson was insistent upon the importance of a dairyman securing the very best bulls possible, and mentioned that they had some very good cattle at the Agricultural College. Most men had their fancies on the subject of dairy breeds, but the speaker did not think the average dairyman could get a better animal for his requirements than the half-bred Jersey cow. From her the dairyman would get the best return for the food consumed.

Mr. F. G. Jones (Biggenden) said that in the Biggenden district they were not much troubled with vagrant bulls, for most of the farmers had gone in for high-class animals, and consequently looked after them more than they otherwise might. He endorsed the contents of the paper read by Mr. Keys; and, more especially, the remarks on the rearing of calves. The general impression was against that practice; but, speaking from an experience of twenty-five years, Mr. Jones thought the right way to rear calves was to let them run with their mothers for a certain time. He allowed them a week, at least. If the weather was unfavourable, he allowed the calves to run with their mothers until it cleared up. He found no difficulty with the cows through the practice, and when he took the calves away the cows let their milk down. He did not find it necessary to bail the cows for milking purposes. He milked from sixty to eighty head, and not 10 per cent. had to go into the bail, and those were only young cows that were not properly broken in. It was just as easy to train the cows to be milked in the open, and far less trouble.

Mr. W. Deacon (Allora) said that, so far as he recollected, what Mr. Thynne had agreed to do at the first Conference at Gatton was, that any society, or any prominent dairyman in a district, could get a bull from the Department for a certain time on condition that he took care of it and only charged a certain fee for service.

Mr. Coulson: That is what I wanted; but he would not agree to that.

Mr. Deacon said that his impression was that one of the bulls was offered to him, and that he was going to take it, but that he further thought the animal would be too much bother, for it would be undertaking a responsibility in connection with other people's cattle which, at the time, he did not care about.

The Chairman: Quite recently we bought several bulls for the Agricultural College at Gatton, simply because there were not sufficient bulls there for our own dairy herd. We are arranging to make an annual sale of heifers and bulls from the College. A few weeks ago, in Toowoomba, we put up to auction about 40 head from the College, and they realised satisfactory prices. You must all understand that the College is a very long way from being a self-supporting

institution. The education of the youths there, which is, of course, the primary object of the College, is practically a cost upon the State of £1 per £1. It costs the State about £26 a year to educate the students there. If, on the top of that, the College gives away what the farm produces, it will mean that the institution will become a total wreck so far as revenue is concerned. So far, we have had an abundant sale for every yearling reared at the College, and, in fact, those who want animals must book them months beforehand. The principle, however, that has been indicated in the discussion that we have had is a good one, and obtains in some of the other States. In South Australia and in New South Wales the principle, to a certain degree, prevails, and is now under consideration in this State. Mr. Palmer's resolution, if carried, will, perhaps, go to further it somewhat. Before, however, the Department can distribute bulls, it must acquire them, and it may mean our making further importations from Europe or the South, or, perhaps, making levies on our own good private herds. Of course, we all are pleased to learn how well the dairying stock, generally, is improving. A few years ago many were satisfied with a cow that gave 2 gallons a day, but now, I am glad to say, the farmers are beginning to realise there is not much use wasting time over the cow that gives less than 3 gallons. I would here like to say that I do not want our cane-farmers to get under the impression that every cow in the South is realising over £1 a month, for that is not a fact. However, it costs no more to feed a well-bred cow than it does a nondescript, and it is no more trouble to handle her. Needless to say, the same principle applies in cane-farming and in other branches of rural industry. To give some idea of the extent of the progress of the dairying industry in Southern Queensland, I may say that the value of the butter exported last year, from January to December, was £345,171. The value of the butter raised for home consumption was £294,000, so, therefore, the total value of the industry was £639,000. The value of the cheese produced last year was £57,000. The dairying industry is a big thing down South, and may become a big thing up North. Still I recognise that sugar is king up here, and I think it will be found that sugar, given suitable conditions, will continue to hold sway. There are, however, plenty of portions here where dairying could be conducted satisfactorily, and many will probably find it a good auxiliary industry to go along with cane-farming. I shall be visiting Atherton in a few days, and shall be glad to speak on dairying there. If you are going in for dairying, get hold of the best stuff from the start. If you cannot get a lot of stock, get a few, but get them good.

The resolution was then carried.

ANIMAL AND INSECT PESTS.

[By E. Wright.]

I shall endeavour to treat my subject as it has presented itself to me while engaged as a practical vine-grower for the last fourteen years in the Wide Bay district.

Animal Pests.—The flying fox is perhaps the worst of the fruit-destroying animals in this district and also in all the districts along the Eastern coast of Queensland. Its operations are carried on during night time, and on this account there is a great difficulty in keeping it away from the fruit. It is also a very wearisome task for the grower to watch by the fruit trees after he has had a hard day's work in growing the fruit, and after all his careful watching he observes that most of his best fruit is lying on the ground, gnawed by the teeth of the foxes. These pests operate principally on the highest branches, where they find the ripest fruit. They always choose the best fruit on the tree. They knock down and destroy much more than they can eat. Their natural food consists largely of honey or nectar obtained from the blooms of the native Australian trees. When wet weather occurs the honey is washed out of the bloom by the rain, so that their food becomes very scarce and is hard to get. It is during this time that they attack the fruit in largest numbers. You will find them very bad on a dark, wet night, especially after heavy rain, and under cover of the darkness they can

scarcely be distinguished. During the day time they congregate and camp in large numbers in the mountain scrubs or inaccessible places some distance from thickly settled localities. They hang by their hind claws, head downwards. The young fox clings to its mother, which flies about with it until it is able to look after itself. The report of a gun has but little effect on them in a vineyard or orchard when they are feeding there, unless they have been attacked by hunters in their camping ground.

South-east from here (Gympie)—that is, in the region of the Mother Mountains—there are dense scrubs where the foxes camp in thousands. In the summer time you may see them making west a little after sunset. They are in search of food, and will return shortly before daybreak the next morning. Sometimes they take from two to three hours in passing over in one long steady stream. Their numbers are almost incredible; but older settlers declare they are not so numerous as they used to be. This may be true, but they are far more destructive than they used to be, quite probably owing to the extensive clearings and ring-barking which have destroyed a quantity of their native food.

I will not attempt to describe the flying fox, as I think it is familiar to all of you, especially to those that grow fruit. As for the methods of destruction, I may say I have tried many, but so far none has been a very great success. I have spared neither time nor trouble to keep them away, and I find powder and shot to be the best remedy. There is a difficulty in shooting the foxes at night time. This difficulty is when the foxes fly low in the shade of the trees, when even on a bright night you cannot see them. (If the young shooters could be induced to visit the fox camps, instead of shooting at jackasses, kingfishers, and other useful birds, far more good would result.) I would favour a bonus being paid for the claws. This would induce shooting parties to attack the camps and shoot great numbers of them. Never to give the pest any quarter should always be borne in mind. If you see one fox come to your fruit trees, shoot it by all means. If you do not do so, a mob of the foxes will visit you during the following night, and you will have all your work cut out to cope with them.

Certain birds are a great pest to the fruit-grower—that is, the fruit-eating birds. Of these we have several varieties in our district. The following are the worst of them named in order:—Silver eyes, leather heads, blue jays, white lugs, soldier birds, three or four kinds of pigeons (known here as fruit pigeons), blue mountain and rosella parrots, the fruit thrush, and the cobbler's awl, and also some others.

Of the above, the silver eyes are the most destructive. In the fruit season they visit the vineyard in large numbers, and if not checked will destroy half of the crop of soft fruit in a few days. If this bird were to finish one fruit before starting on another, it might be forgiven on account of some other good qualities it is said to possess; but it seems to take a delight in sampling every fruit without regard to its own wants. Thus it often happens that every bunch of grapes on a vine is ruined. Silver eyes, white lugs, leather heads, and some kinds of parrots are honey-eating birds, or, to be more correct, they eat the pollen from the blossoms of the flowering trees and plants. They visit the orchard in flocks when the orange-trees are blooming. Silver eyes, leather heads, white lugs, and the cobbler's awl are each provided with a long sharp bill, which they thrust into the fruit and suck the juice. In grapes especially they seek out the best and sweetest in the vineyard. They pierce the fruit and suck the juice, and then they pass on from one end of the row to the other, damaging as they go.

Silver eyes are the most difficult to deal with. They are so small that you may easily pass them and not see them unless they are chirping. They fear nothing if they are hungry, and it is very difficult to get them out of the vineyard once they get a start. As you cannot shoot them in the vines, you must drive them out. They will not go far away; in fact, they will alight in the nearest trees, and this is the time to attack them with a double-barrel breechloader with No. 10 shot. This is the best shot, because you can bring them down with it where large shot would miss them. I find it best to begin shooting as soon as they appear. Do not let one escape. If you do, you will have all your work to do over again, as those that get away will be there at daybreak the next morning with all their friends ruining the fruit. I believe that this bird is the greatest bird pest that grape-growers have to contend with in the coastal districts of this State, and also of New South Wales. Like the flying fox, these birds are the most troublesome after rain. There are many more fruit-eating birds besides those I have mentioned, but most of these are easily kept in check. The report of a gun will frighten most of them.

Of insects the fruit fly undoubtedly is the worst pest of destructive insects. The fly is very numerous at present in all the coastal districts. It attacks almost all the fruits grown in my district, including the orange, mandarins, comquats, bananas, and all deciduous fruits, and sometimes grapes. The matured insect is about the size of a common house fly, the colour and markings being those of a wasp. As you all know, the fly lays its eggs in the fruit about the time the fruit is matured. By the time the fruit is ripened, the larvæ or maggots have done their work, and the fruit is spoiled and falls to the ground. It is not every year that the fly attacks the grape, but when it does it begins on the green berries of the slow-maturing varieties, and they soon fall off. I have not seen the maggots come to maturity in grapes, but at the same time they do a deal of damage to the grapes. Up to the present time there is no known cure for this pest. The Department of Agriculture often draws the attention of fruit-growers and others to the great importance of keeping the pest in check. They recommend that all infested fruit should be gathered and boiled or buried. That is their only known remedy, which is no remedy at all, for in the scrubs there are swarms of fruit flies. If a man owns one tree or a thousand, he is liable to a fine if he allow infested fruit to lie about his place. Fruit dealers, auctioneers, and retailers are liable to have all infested fruit destroyed. It is a poor satisfaction to know that you have to boil your fruit after you have taken the trouble to grow it. I think I am right in saying that at present there is no known remedy, except covering up the trees with a mosquito net. While this answers the purpose for small trees, it is altogether out of place for dealing with large ones. We have three kinds of caterpillars that attack the grape vine—the black, red, white and green caterpillars. They are all very destructive to the foliage if not taken in hand in time. But they are easily seen and got rid of. Take a pair of scissors and clip the caterpillar in two. Then we have two kinds of vinehoppers—the red and the green. Both kinds appear to work in the same manner. They are hatched at the time the buds are bursting on the vine, and start to feed on them right away. As the young leaves appear they eat them, until the fruit bunches appear. Then they feed on these until the fruit is set. They then turn to the leaves again until the fruit is ripe. Then they feed on the sweetest and best bunches. Hand-picking or spraying with Paris green is the only remedy I know of for these pests. These hoppers also eat the young oranges and mandarins when about the size of peas. There are two kinds of elephant beetles that are a great pest to the vine-grower—a large one and a small one. They are both very destructive to grape vines. They also cause the borer in the orange and other fruit trees. About February, in my district, the beetle lays its eggs in the bark of the vine or tree, and two months later the borer is at work between the bark and the wood. This is where it works all winter, doing a lot of damage, often ring-barking the trees and killing them. In the spring time it has changed to a beetle again, and eats its way out of the vine just as the buds are bursting. It eats the buds as they burst. I have known one beetle to travel the length of three trellised vines, and eat the whole of the buds. Of course, those vines are no good for that year, and sometimes the vines will die out after the beetles have attacked them. The smaller variety is about the size of a grain of wheat, and possesses much the same habits as the larger one. It is very destructive, and is difficult to detect. There is no remedy for this pest but hand-picking.

Fruit-Sucking Moth.—In some years, a large moth known as the fruit-sucking moth is very destructive. It sucks the juice out of many fruits, such as the orange, persimmon, mangoes, and grapes. This moth works at night, and is very destructive to all the above-named fruits. A description and photographic illustrations of the moth and caterpillars by Mr. Henry Tryon will be found in the *Agricultural Journal* for April, 1898. I have tried the moth-traps to destroy the pest, but without success. Catching by hand at night with a light is the best way to destroy them that I know of. I have not enumerated all the orchard and vineyard pests by any means, but, as opportunity appears, I will endeavour to furnish the Department of Agriculture or any gentlemen present with specimens of the different pests mentioned should they wish it. With reference to keeping pests in subjection, I think that individual or united efforts by those interested will be preferable to depending much on Government action. The Department of Agriculture with its staff of experts may help the fruit-grower by preventing any new pests from being introduced into the State and by systematic experiments for the mitigation and destruction of fruit pests. This will enable the fruit-grower to recognise and to intelligently deal with these fruit pests. But, after the Government has done its part, it is only by those interested, who are on the spot

and whose duty it is to look to their own welfare, that by destroying and keeping these pests in check any permanent good will be done.

The CHAIRMAN: There are many fruit men here who have taken a keen interest in their business. I shall be glad if such will give us their experience in combating pests, and further discuss the matter from the standpoint of meeting the pests and, if possible, beating them. It is one thing to know we have an enemy, but the next thing is to know how to meet and vanquish him. I hope, therefore, that those who have anything to express concerning animal and fruit pests will tell us their experience, directing their remarks, as far as possible, to the matter of fighting the pests.

Mr. J. WITTMAN (Nanango) used to have a hobby for fruit-growing, but finally got disgusted with it. He was first of all troubled with flying foxes in the night time, but he took care they never brought their cousins the next night. Foxes generally make for the highest trees when first attacking a garden, and the speaker's advice to those on the lookout was, when a branch was seen moving, to fire into it, and the fox would in all probability be shot. At any rate he had been able to scare away flying foxes from his orchard by shooting operations initiated at the early stage of the foxes' attack. The next great difficulty he had was with the little scrub birds—regent birds, rifle birds, satin birds, white lugs, silver eyes, &c. The silver eye was what he called a grape-pecker. One year a pair of sparrow hawks built a nest within a chain of Mr. Wittman's garden, and hatched their young at the times the grapes and apricots were ripening. Those sparrow hawks kept his orchard free that year. Doubtless, many another man would have destroyed that hawk's nest, but the hawks that season kept Mr. Wittman's garden clean, and gave him many a quarter of an hour's amusement, for he often watched them catching the fruit-eaters and dropping them for their young to eat. Since then he had never allowed a boy to destroy sparrow hawks, and that reminded him how many men went out of their way to kill some of the reptiles and animals in the scrubs. He never allowed one of his sons to kill an iguana. The scrub magpie was a bad bird for grapes, and he had often seen iguanas destroying scrub magpies' nests. Yet they would often see a man get off his horse on the road to kill an iguana, that had never done him any harm. On the subject of maggoty fruit Mr. Wittman said it was contended by some that all such fruit should be destroyed. When he first started at Coolabunia, he was 10 miles from the nearest fruit tree. He planted some seeds and reared some trees, but when the latter produced their first fruit it was maggoty. That larvæ, however, could not have come from flies from any cultivated fruit trees, for, as said before, there were no others in the vicinity. He had noticed peach-trees growing in couch grass that were not touched by maggots, and had also been told that if a man did not cultivate he would not have maggots. With that idea, he wrote to a seedsman for seed of a grass that would cover the whole of his orchard, and yet not grow too high, but he finally found that the simplest and apparently the only effective way of getting rid of the maggots was by selling his farm.

Mr. B. T. MCKAY (Maryborough) was glad that all the fruit-growers of Queensland were not of the same class as the last speaker, and he did not think he had ever listened to a more doleful plaint than the one contained in the last paper. They had pests in politics, and they had pests in fruit, but he was quite sure that nowhere in his district could one find such a pest as the grub that he had seen in the canefields in the Cairns district. There they could see patches of 200 and 300 acres of cane absolutely dead, which was something he could not have realised, unless he had seen it, and it had assisted him in forming his judgment as to the difficulties that the cane-growers of the district had to fight against. The Chairman had once complimented him on the brevity of his speeches, and he would, therefore, conclude by advising the fruit-grower to pick up his dead fruit, cyanide his trees, keep the grass from his orchard, and cultivate.

Mr. W. G. Winnett (Beenleigh) said that about three years ago the board, of which he had the honour to be a member, initiated a movement for destroying flying foxes. After they had written about thirty letters to other boards, asking them to co-operate in the destruction, they got three replies. His board's request was that all the boards should combine, and try and find some means for eradicating the flying-fox pest—say, by offering a reward for the scalps. His shire offered 3d. per scalp, and they received some hundreds in consequence. But, after a little time, they found some of the scalps were coming from a neighbouring shire, which was only offering 1½d. per scalp. That was not the worst effect of the bounty, for they found that, while parts of their lands were cleared of flying foxes, yet they found flying foxes, which had been disturbed in other shires, invading their borders. Reference had been made that afternoon to cyaniding, and he might say that, personally, he had had some experience of this system of dealing with scale diseases. Mr. Benson had been down in the speaker's district about three years ago, and as a result of his arguments two of the principal orchardists there had gone in for cyaniding plants. One man had spent £40 in a plant, and reckoned that he was recompensed for his outlay by the increased returns in the first year's crop after cyaniding. Mr. Winnett had planted a lot of mandarins, which had got so badly infested with scale and smut that he determined, after five years' struggling, that he would give up the whole thing. He then went in, however, for a couple of cyaniding tents, and to-day his orchard was as pretty a sight as could be seen anywhere.

Mr. W. W. Burnett (Woombye) was quite in accord with the idea of picking up fruit, and in cyaniding. This year he had had very little fly. The fruit fly might be bad in one orchard, and yet in a neighbour's it would be hardly noticeable. A good deal depended upon the picking up of the fallen fruit. It stood to reason that if they had a lot of fruit flies about, that they would have the fly pretty bad in their fruit, and that if they gathered up the fallen fruit that contained the larvæ of the fly, they would be doing something to keep the pest down. It was a lazy man's argument to say that the fruits in the scrub would keep the supply of fruit flies going. Down his way, there was very little native fruit in the scrubs, and he did not think there was much up North, with the exception, perhaps, of the guava and the wild orange. He did not think it was necessary to boil the fallen fruit. They might notice that, if the fruit was exposed for a few hours in the sun, that was generally sufficient to destroy the larvæ. He had proved it, and thought that as long as the fruit was gathered nothing more was required in that connection. Of course, there was no objection to the fruit being boiled; but, personally, he thought it was hardly necessary.

Mr. W. Palmer (Bowen) was sorry that Mr. Wright's paper was hardly likely to be a good advertisement for the State of Queensland. Unfortunately, however, they could not get away from the fact that fruit pests were pretty numerous all over Queensland. Moreover, they did not seem to have a partiality for any particular locality. The flying fox was common enough in the Bowen district, but during the last couple of months he was glad to say he had not seen him in such large numbers as formerly. Mr. Palmer, however, did not flatter himself that the fox had said good-bye to the Bowen district. *Au revoir* was more likely the expression that had been used. They had moths and other pests at Bowen, but were trying to deal with them all as practical men. They had to thank Mr. Benson for much information, which had been of material assistance in dealing with their fruit foes.

Mr. H. E. Bray (Tinana) said that the pest that was giving them the most trouble in his district was the man who bought a dirty orchard. They would remember the Conference that was held in Brisbane on the subject of the Diseases in Plants Act. He, amongst others, went down to that Conference, and there they threshed the matter out. Unfortunately, however, the minority at the Conference who did not want Government inspectors, but inspectors

appointed by local boards, not being satisfied with the decisions arrived at at the Conference, started to circularise all round, with the result that the decisions of the Conference were hung up indefinitely, and would probably remain so, which, of course, meant that the time of those who had attended the Conference had been practically wasted. They did not cyanide in his immediate district, but found that picking up the fallen fruit, spraying the trees with a resin wash, and cultivation, would keep most of the pests down. After all, perhaps their greatest pest was the middleman, and the only way to fight him was by the fruit-growers of Queensland combining for that purpose. He thought they should all unite, and form the present Citrus Growers' Association into a limited liability company, for it was only by such means that they would be able to fight the middleman, and make fruit-growing a paying and profitable industry.

Mr. H. Heinemann (Redland Bay) quite agreed with the remarks of Mr. McKay as to the necessity for good cultivation. He believed in good cultivation, although he was not against cyaniding. He was, however, against any taxation on the fruit-grower of 2s. 6d. per acre. He thought any man who called himself a fruit-grower should be quite capable of looking after his own affairs, and he contended that good cultivation, manuring, and irrigation would do far more for fruit-growing than the appointment of any more inspectors.

Mr. C. F. M. Fischer (Zillmere) said that evidently Mr. Heinemann's experience in fruit-growing had been a happier one than his and many others who had not been so successful as Mr. Wittman in getting rid of his pests by selling his orchard. Mr. Fischer had first suffered from diseases in pines, and, as a consequence, had gone in for mixed fruits. He had had to buy his experience, and had never tried to overcome his difficulties by the jocular way of disposing of his farm. He had to say, however, that really it seemed the only practical way of dealing with the fruit fly, for that certainly was, to the fruit-grower, the scourge of scourges. The flying fox might sometimes be bad, say when its natural supplies in the tea-trees and other native flowers ran short. One year the fruit-growers suffered immensely from flying foxes, and even the State farms admitted severe damage from this cause. But, of late years, with a fruitful season and not too abundant moisture, they had suffered very little from flying foxes. Scales, insects, and birds might all contribute their quota to harass the fruit-grower, but Mr. Fischer would readily take on all these pests at one time in exchange for the insignificant little fruit fly. For many years he could hardly credit that a little fly was doing all the damage that he could see was being done in orchards capable of producing hundreds of thousands of fruit where one could hardly have got a hundred sound fruit, if all were allowed to go to maturity. He knew there was a remedy for the fruit fly, and that the Government Fruit Expert had done his level best to find a praticable means of combating the pest. Doubtless, Mr. Benson was still on the trail of the fruit fly, for he was not one likely to give up because he had not at first succeeded. Mr. Benson had been out at the Speaker's place, and had netted in several trees with entirely successful results. He had netted two kinds of plums, and the guava that the fruit fly was so fond of. Mr. Fischer had allowed the fruit on the trees covered with netting to mature, and had found the fruit entirely free from maggots, but the whole question resolved itself into one of cost. If they could get a cheap remedy for the fruit fly, he believed one of the greatest blessings possible would have been conferred on the Queensland fruit industry. He, too, had noticed the same thing that had been remarked by Mr. Wittman—namely, that where there was no cultivation and the ground under the trees covered with a sward of grass that the fruit fly pest did not seem so bad. Mr. Fischer, however, supposed that it was on the principle that the fruit fly liked the best fruit, and always found the best fruit to work on. Moreover, probably the maggot had some difficulty in getting through the grass into the soil, and that when there, the fly had some difficulty in getting out again. He had, however,

found that the more a man manured fruit trees, and the more luxuriantly they were got to grow, the more the fruit fly seemed to revel in the orchard. His peach-trees which suffered most were his best China flats and clingstones. Doubtless, had growers gone in for dwarfing, as in Japan, they might now be able to cope with the fly pest by the use of netting to prevent the flies from stinging the fruit, but, as it was, with their large trees, netting was hardly practicable. He believed that the gathering up of the rotten fruit would materially assist in keeping the pest in check, and from the little experience he had had in running fowls in an orchard some years ago (he had several hundred fowls), he believed the assistance of poultry was not to be despised in keeping down fruit pests. At any rate, on that occasion he found his fruit was considerably freer from maggots than it had been at preceding seasons. But as he had lived too long to form conclusions on insufficient premises, he was not too sure whether the fowls were the cause of his comparative immunity from fruit fly during that particular season. Still, fowls, if allowed to roam in an orchard, certainly pick up a good many maggots.

Mr. A. Rickert (Allora) said there was a good deal of difference of opinion with respect to the fruit fly pest. He remembered forty years ago going on a plain and planting such peach-trees as were within his reach. They were very late peaches, and when they fruited the fruit was as badly affected with the fly as any peaches he had since seen. Still, there was not an orchard within 30 miles of those trees. Since then, he had had another orchard, and had experimented and tried what he could do to minimise the ravages of the fly. Judging from that experience, he was of opinion that a man might just as well try and exterminate the ordinary flies that pestered them in summer time as try and exterminate the fruit fly. He thought it would be wrong to force people, by legislation, to boil or bury their fruit, with the idea of clearing the country of fruit fly. That pest was native to the country, and would remain here.

Mr. C. Cotterell (Dulong) said he had the honour to represent the North Coast Central Association, which was a body that had paid a good deal of attention to this matter of eradicating animal and insect pests. They had been trying to destroy the flying fox, and had got their young people to interest themselves in the destruction of the foxes in the daytime. By this means they had had thousands of them killed. Lately, he was glad to say, the flying fox had not been particularly troublesome in their district. On the subject of fruit pests generally, he could not speak with any great degree of certainty, but he might say, with regard to the fruit fly, that several growers on the Buderim Mountain had met with a considerable amount of success in combating this pest by the use of tangle-toe. The method was to hang ripe oranges in the fruit trees smeared with tangle-toe, and by that means they caught thousands of fruit flies. He was convinced that, although the fruit fly might be a native of the State, and although it might have been common enough forty years ago, that was no argument why they should allow it to play uninterrupted havoc amongst their fruit. He felt certain that one of the best things they could do was to pick up their fallen fruit and either boil or bury it. Otherwise they were simply breeding the flies, and he felt sure that if they neglected their orchards they would not have much fruit for market in a year or so. With regard to scale pests, the most effective remedy that he had yet discovered and adopted was cyaniding. They had been instructed in the system by Mr. Benson, had followed out his instructions, and the result was, that they had trees in their orchards to-day which had been cyanided sixteen months ago, and which, with the exception of one or two, were destitute of any trace of scale. He believed, moreover, in thorough cultivation. If they had 200 trees growing, they should look after them, study them, keep the orchard clean, and, if they thought it necessary, manure the trees. By so doing, growers would find that their trees would remain vigorous, and that scale pests would have very little effect on them.

Mr. F. W. Peek (Chamber of Agriculture) was very pleased the matter of flying fox destruction had come up for discussion that afternoon. At a previous Conference a motion was brought forward that it would be in the interests of fruit-growers if the services of Mr. Pound were devoted to the Agricultural Department, for a time, for the purpose of discovering some bacteria which would have the effect of disseminating a contagious disease among the flying foxes of the State; and Mr. Pound at that time stated that he would be glad to receive specimens of any flying foxes which had apparently died from any peculiar disease or epidemic. The question of the grubs in the sugar-cane was certainly a most serious one, and one, moreover, that would have to be faced. Another trouble was the sweet potato weevil. There were some hundreds of acres this year on which crops of sweet potatoes had been spoiled by this little steel-blue beetle. Unless this latter matter was taken in hand by the Department, or by a combination of farmers, Mr. Peek was certain they would have something very serious to answer for in the near future. Other States were experimenting in the matters dealing with insect pest destruction, and he believed good work could be done if the whole services of a scientist were devoted to the finding of means for the extermination of the insect foes that the farmers had in Queensland.

Mr. W. Deacon (Allora) said they had one pest on the Downs which was giving them a lot of trouble, and that was the wire worm. It had a long life, and Mr. Deacon understood it lived for four or five years. It housed itself in the summer time among rubbish, and the first year it was about a quarter of an inch long. The next, it was half an inch long, and then grew to about three-quarters of an inch in length. It circled about in the ground, and destroyed whole paddocks of wheat. As with the other pests that had been mentioned, the remedy was first-class cultivation, and the burning of rubbish. For many diseases of wheat, fire was a good preventive, and Mr. Deacon's advice to the wheat farmer was to allow no rubbish on his farm. They had the fruit fly, but somehow or other they had not been troubled by it very much. He did not know why, but for all that he believed in the picking up of fallen fruit. He did not believe, however, in burying the fruit, but rather in giving it to the pigs. It was then of some use, and, after all, damaged fruit was not a bad food for pigs. One of the Department's experts had said that it was essential that the fruit should be boiled, but Mr. Deacon very much questioned whether the fly would pass through a pig unharmed.

Mr. A. H. Benson (Instructor in Fruit Culture): It was not I. I am reading a short paper some time this evening, and a good deal of the matter that has been traversed upon by the speakers this afternoon will be touched upon then. I will therefore now confine myself to one or two main points that have cropped up. It is a most foolish thing to say that it is absurd to gather up and destroy your fallen fruit. Do not throw the whole blame for the fruit fly on the native fruits in the scrubs. If you allow the pest to breed in our cultivated fruits, the pest will breed ten times quicker than it would in the scrubs. It seems to me to be only sound common sense that if you destroy the larvæ, so will you prevent the coming into existence of the same number of flies. In a cultivated fruit you will not infrequently find from twenty to thirty maggots, but in the native fruits, Mr. Tryon tells me, from careful observation, that at least from 70 to 90 per cent. of the maggots are parasitised by other parasites—that is to say, the maggots have small internal parasites in their bodies. In the native fruits, the skin is thin, and the flesh of comparatively no depth. The stinging wasps, which are the origin of these parasites of the fruit fly maggots, can sting through the skin, and easily get at the larvæ of the fruit fly. But in the comparatively thick-skinned and deep-fleshed cultivated fruits, the fruit fly maggots go straight for the centre of the fruit, where they are absolutely safe from the parasites, which have no difficulty in getting at the larvæ in the thin-skinned and fleshless scrub fruits. It is therefore in cultivated fruits that growers must expect the

fruit fly to breed, and there certainly they do chiefly breed, more especially in those abandoned orchards which are the curse of the Queensland fruit industry. Mr. Burnett has mentioned to me a very interesting fact: Coffee is one of the best traps for the fruit fly. The fruit fly lays its eggs wholesale in the coffee berry. I need hardly mention that the flesh or pulp of the coffee berry has no commercial value, and the fruit fly larvæ, which lives on fruit flesh, does not, therefore, in the slightest degree hurt the coffee. When pulping coffee about the Buderim Mountain, you will see thousands of fruit fly larvæ in the discarded pulp, and it would therefore appear that coffee may possibly be an excellent decoy to have in an orchard. Early in the season, the first-ripened fruits that are stung, either by the corn moth or the fruit fly, turn yellow. Such fruits particularly attract the fruit fly for the purpose of laying its eggs therein. Knowing the attraction of such fruit for the fly, I would suggest taking advantage of the partiality, by taking the fruit, smearing it with tangle-foot, and hanging it amongst your green oranges. By that means you should be able to catch hundreds of flies. Tangle-foot can be obtained from Messrs. Taylor and College, of Brisbane, or you can easily make it yourselves by mixing non-drying oil with resin. The rule for making it is very simple. If your mixture is too hard, put in more oil. If it is too soft, put in more resin. Smear oranges with the mixture, place them in a conspicuous position, and you will catch hundreds of fruit flies which would otherwise lay their eggs in your good fruit. I was glad to hear a method described of destroying fruit-sucking bugs. The simplest method is the one of hanging up ripening fruit early in the season, and gathering them is a simple and easy process. These insects are always attracted by ripe fruit. In the South we have practically only one sucking moth, which was described some years ago by Mr. Henry Tryon in the *Queensland Agricultural Journal.* My experience of the wire worm goes back to the time when I was a small boy in England and Scotland. In the latter country, the method of dealing with the wire worm was by the use of nick rollers, and by the compression of the soil. In addition to that, when the wire worm was bad, we always top-dressed with nitrate of soda. Eating down with sheep, and the consequent tramping down of the ground with the sharp feet of the sheep, was also very effective. If the wheat is in the early stage, use the roller, or walk your sheep over the land.

Mr. Rickert: The rollers will not do it, but the sheep will.

Mr. Benson: The Cambridge roller is the kind a good deal used for this purpose in the old country.

The Chairman: Before adjourning till the evening, we will take the next paper, and a discussion may follow if time permits. Mr. J. J. Fanning, of the Townsville Pastoral and Agricultural Association, will read a paper which has been prepared by Mr. T. A. Gulliver of Townsville—

A FEW NOTES ON THE FRUIT INDUSTRY OF NORTH QUEENSLAND.

[By T. A. Gulliver.]

The banana trade has become a very large industry, and there is scarcely any limit to what it may yet assume. The writer remembers well, when living in the Hodgkinson less than a quarter of a century ago, paying 3s. per dozen for coarse, ill-flavoured plantains, and only a year or two ago, when touring the Southern States, he could purchase Queensland bananas in Sydney and Melbourne for 3d. and 4d. per dozen. From returns supplied by the various shipping companies, I find that there is an average of 150,000 bunches per month exported from the Northern ports, the freight alone amounting to £7,500. These are very large figures, and the first question that arises is, Do the shipping companies give the shipper a fair show? I maintain that they do not, and consider the time has arrived for the shipping companies to make better provision for this increasing export trade, or for the growers to combine and provide the necessary shipping accommodation for the fruit. The present system is crude in the extreme, and results in very serious losses to the grower. Imagine 25,000 and 30,000 bunches of bananas stowed on top of each other in a ship's hold! Is it any wonder that

the grower frequently loses 25 and 30 per cent. of his shipment? I have heard of men standing up to their knees in rotten fruit at the bottom of a ship's hold at the Sydney and Melbourne wharves bailing out the rotten bananas into barges, to be taken out into the bay and sunk; yet the shipping companies are paid for every bunch of fruit that is put on board. I happened to be in Brisbane about the middle of last winter, and was very much struck with the quantities of delicious-looking plums, with the bloom on them as though they had just been gathered. I could not understand how plums could be procured in midwinter, and made inquiries, when, to my utter astonishment, I found they had come from California. Now, here is a wrinkle for the Northern fruit-growers, fresh plums imported into Australia from America, with the bloom on them as though they had just been gathered, whilst we cannot send green, half-matured bananas from here to Melbourne without losing at least 25 per cent. It shows how much better they understand these things in America than we do, and the sooner we take a leaf out of their book the better it will be for us. In speaking to a representative of one of the largest shipping firms upon this subject last week, he assured me the company did all they could to assist the shipper, and I have no doubt they do the best they can with the means at their disposal, but the facilities are inadequate. The trade has passed from the speculative stage, and it is the duty of the shipping companies to provide proper facilities for carrying fruit, or be prepared to see the trade taken out of their hands altogether. I have said that the banana trade has grown to a very big thing, but it is only yet in its infancy, so to speak, when it is considered that the banana is one of the most useful plants of the world, and the fruit is one of the greatest blessings bestowed on mankind in hot climates. It does not require a great stretch of the imagination to contemplate that, with proper shipping facilities, the trade would increase a hundredfold. John Williams, the great missionary, introduced the Cavendish banana, from the Duke of Devonshire's conservatories at Chatsworth, into Fiji, whence it was carried by the Rev. G. Pritchard to the Tonga group, and its introduction there has put an effectual stop to famines, which previously were common in these islands. It is the Cavendish banana (a Chinese species) which is cultivated in North Queensland. "But for bananas," says Dr. Wright, "Jamaica would be scarcely habitable, as no species of provisions would supply its place. Even flour or bread itself would be less appreciable and less able to support the laborious negro so as to enable him to do his work and keep his health." As an article of food the banana is perfectly wholesome and digestible, and is very satisfying. The unripe fruit abounds in starch, but in the process of ripening this disappears, being converted into sugars, until in the ripe fruit practically no starch is left. It will, therefore, be seen that the green fruit is more nourishing than when ripe, and in countries where the banana is the staff of life the ripe fruit is rarely seen. The nutritive value of the banana is superior to that of the potato, as the banana yields 37 per cent. and the potato only 25 per cent. of dry matter. We in Queensland scarcely yet understand the value of the banana, and use it only as a desert fruit, but when it is better understood the export in its different forms will be very great indeed, and the idle lands on the Daintree and all other Northern rivers will be nothing but immense banana plantations. A few uses to which the banana may be put will, perhaps, better illustrate its value as an article of food. Baker, in his "Albert Nyanza," thus writes of the banana:—"Curious as it may appear, although we were in the land of plantains, the ripe fruit was in the greatest scarcity. The natives invariably eat them unripe, the green fruit, when boiled, being a fair substitute for potatoes; the ripe plantains were used for brewing plantain cider, but they were never eaten. The method of cider-making was simple. The fruit was buried in a deep hole and covered with straw and earth; at the expiration of about eight days the green plantains thus deposited had become ripe; they were then peeled and pulped within a large wooden trough resembling a canoe. This was filled with water, and the pulp being well mashed and stirred, it was left to ferment for two days, after which time it was fit to drink. Throughout the country of Unyoro, plantains in various forms were the staple article of food, upon which the inhabitants placed more dependence than upon all other crops. The green plantains were not only used as potatoes, but when peeled were cut in thin slices and dried in the sun until crisp; in this state they were stored in the granaries, and, when required for use, they were boiled into a pulp and made into a palatable soup or stew. Flour of plantains was remarkably good. This was made by grinding the fruit when dried as described. It was then, as usual with all other articles in that country, most beautifully packed in long narrow parcels, either formed of plantain bark or of the white interior of rushes

worked into mats. This bark served as brown paper, but had the advantage of being waterproof. The fibre of the plantain formed both thread and cord, thus the principal requirements of the natives were supplied by this most useful tree." In Fiji the banana is split in half and sandwiched with grated cocoanut or sugar-cane; they are served with cocoanut milk, and thus make a favourite pudding, used as well by the white settlers as by the natives. They are also beaten into a pulp and diluted with cocoanut milk or water. In this way they are prepared in large quantities in a kind of cistern with a framework of wood, lined with the leaves of the trees, one being a sufficient load for six or eight men. As many as eight of such vessels full are sometimes consumed at a feast. Substituting milk and sugar for the cocoanut milk and water of the Fijian receipt, we have a deliciously cool and wholesome summer dish suited to all ages. In India the young shoots form a delicate vegetable. For use as bread they are roasted or boiled when just fully grown and before beginning to ripen; in the ripe stage, the fruit is sliced and fried in butter, or dried and preserved like figs. There are many more ways of treating the banana, but I have given a few to show what a very valuable asset we have in this fruit, and to what dimensions the export trade may develop, when proper shipping facilities are offered, and it is the duty of all interested in the future of North Queensland to agitate for this to be done.

The mango, granadilla, papaw, and many other tropical fruits would find a ready market in the Southern States were proper shipping facilities provided; but under the present conditions the shipper is lucky who is not brought into debt for freight and other expenses. Mangoes are at present picked so green that they have no flavour, and consequently are not held in favour; but if they were allowed to mature and shipped in the way that the plums are from California, there is no doubt a large trade would be the result, particularly if growers would try to improve the varieties. There are plenty of the choicest varieties of mangoes now grown in Queensland, and, therefore, seed is procurable. There is, consequently, no excuse for growing and exporting the rubbish that is to be seen in the Brisbane and Sydney markets. The papaw is a very valuable fruit, and there is scarcely any limit to the demand that would arise for it in the Southern States, could it be shipped under proper conditions. I could go on enlarging upon this matter until I wearied you, as I take such a keen interest in it; but I hope I have said enough to show what the fruit trade of North Queensland is likely to develop into, when either the present shipping companies or some new company provide the proper facilities for this export trade.

CARE NEEDED IN PICKING ORANGES.

[By Albert Smith, of Taloonda, Bowen.]

The extreme care needed in picking oranges for market is shown by recent investigations carried out by the Government Entomologist of the United States. About 20 per cent. of the fruit is found injured by the clipping shears, examinations made of shipments from twenty-two groves ranging from 4.2 per cent. to 35 per cent. The injury is partly done by pointed shears running into the fruit, but more usually from clipping off a portion of the skin. Investigation shows that a great many orange-pickers are habitually and grossly careless. The pomologist says that probably not 5 per cent. of this clipper cut fruit is detected as it passes through the hands of the grader or the packer. The prominent gashes only are seen. The remainder of the injured oranges, of course, do not all decay, but the injury makes them particularly suceptible to rot from blue mould if the conditions become favourable at any time for its development. In the experiments, as much as 40 per cent. of the cut fruit developed decay under ordinary conditions, while uninjured fruit under similar conditions showed less than 1 per cent. The essential conditions for this decay are: that the spores of the disease be present; that there be sufficient moisture, and temperature high enough to germinate them, and to make them grow; and a weakness in the skin of the orange through which the disease can enter. If any one of these factors is wanting, there is slight chance for the orange to decay from this disease. A fundamental requirement, either for successful shipping or for storing, is sound fruit.

The principal object of every fruit-grower should be to place his fruit on the market in an attractive way, and to do this requires careful handling and more careful packing, as I think the packing is most essential. Fruit that is not properly packed does not carry, inasmuch as it becomes loose, and is thereby knocked about in the case when handled, and when it is opened up the cases are not full, necessitating the repacking, which means a sure loss

of 5 or 6 per cent. at least. I would suggest that the conference urge upon the Department of Agriculture and Stock the advisability of assisting the grower to find outside markets, and also to give them pecuniary assistance in making experimental shipments, which, if proved successful, would be a means of producing revenue; the Government have not been disposed to offer the assistance abovementioned so far.

Last July, a trial shipment to London was made per ss. "Hector," which resulted in a dead failure, the growers losing all their fruit and time, besides having to meet the bill for charges, which must have been considerable in some cases. I have no doubt that with a fast service and proper accommodation the fruit could be placed in a sound condition in the old country, as we have kept fruit for six weeks in perfect condition last year. The time occupied from Bowen to Melbourne is nearly two weeks; and, being picked one week earlier, means that our fruit is placed in Melbourne after being taken from the trees three weeks, and moreover in splendid condition, so the capabilities, as far as keeping are concerned, should not deter anyone from the project.

Grading is another important point, and without grading you can't pack properly, as every case of fruit must have even fruit in it. There is no danger of anyone losing the best market returns so long as they are prepared to place their fruit in an attractive manner.

Fumigating.

In our experience fumigating has not affected our fruit, although they may be better if not treated.

Mr. J. C. Brünnich (Agricultural Chemist): Mr. Gulliver says the green banana is of greater nutritive value than the ripe fruit, but I think he has put the remark in a way he hardly intended. He is quite right in stating that the ripe fruit contains more sugar than the green fruit, because the starch in the fruit is changed into sugar during the process of ripening. Sugar, however, has more value than starch as a food, and one of the great points in the value of the ripe banana as a food is, that its starch has been changed into sugar, or, in other words, has been partially digested.

With regard to Mr. Deacon's advice of "Burn, burn, burn," I must state that one of our great wants in Queensland soils is vegetable mould. This matter of burning so-called rubbish in the canefields has been brought forward in connection with the grub pest. It is a very disputed point whether the trash, which in canefields amounts to a very considerable bulk, should be burned, as is frequently done in the Mackay district, or whether it should be buried and ploughed under as is practised by more modern planters. Undoubtedly it is very natural to think that rubbish should be a breeding ground for insect life. But still the idea is not borne out by practical experience. It has been shown that in cases where the cane trash was buried, the beetle was no worse than where it had been burned. In fact, there appears to be any amount of rubbish in the headlands quite sufficient to provide breeding grounds. Where actual experiments had been made between pieces of land where the trash had been ploughed in, and where it had been burned, the cane in many instances of the first case showed less signs from the ravages of grubs, probably in consequence of the increased vitality that was given to it by reason of the organic matter with which its soil was enriched. It is undoubtedly wrong to always adopt the principle of "Burn, burn, burn," for every bit of organic matter you can get back into your land is of advantage, especially if, as is frequently the case, your land lacks in vegetable humus.

Mr. W. Griffin (Cairns) said that they had deputed some members of their association to interview an agricultural expert who had recently visited the Hambledon Plantation on behalf of the Colonial Sugar Refining Company, and that the gentleman in question—Mr. Clarke—related to them the following experiment:—He got two barrels, or rather a cask cut in two, and filled them up with soil. No. 1, however, was devoid altogether of vegetable matter; but, in No. 2, prior to putting in the soil, rubbish and chaffed trash were placed at the bottom and mingled with the soil. Cane plants were placed in each tub. Both germinated, but after three weeks' time the plant in the

tub which contained no trash or rubbish died. In the other tub, however, which had the rubbish at the bottom, the cane was growing vigorously. Grubs were put into both tubs at the time of planting. In the tub in which there was no rubbish, the grubs had tackled the plant, but in the other, the cane had not been affected at all by grubs. The grubs were simply living among the rubbish. The inference from the experiment was, that the richer the soil in humus the better, and it also appeared that they might assume, if there was no vegetable matter in the soil, it meant that the grubs would have to attack the cane.

Mr. W. Deacon (Allora) said that in recommending burning he had simply voiced the opinion of one of the highest of entomological authorities, and that was the late Miss Eleanor Ormerod. That lady stated that the wire worm revelled in all sorts of rubbish, and her advice was to burn such rubbish. Mr. Deacon believed in ploughing-in green stuff, but seemed to be rather in favour of burning rubbish.

Mr. W. W. Burnett (Woombye) said he was an old grower of bananas, and twenty years ago, when there was not the market in the south for bananas that there was now, he had experimented with the evaporating and drying of bananas. They catered for the market in every way, but he did not think that he and the others who were interested with him in the venture made sufficient out of the dried bananas they sold to pay for the wages of those they employed in the drying operations. They also tried the green bananas; they were very nice and palatable, but somehow or other they would not take with the public. They also tried cutting the banana under water in slices, drying the slices, and then making meal of them. The meal made was very nutritious and pleasant to the taste, but, unfortunately, it was not pleasing to the eye. For this latter reason it was impossible to push it into the favour of the public, and the enterprise had to be dropped.

Mr. W. Palmer (Bowen) thought the paper that had been read a good one. There was one thing it dealt with, which was of considerable interest to the Bowen fruit-growers, and that was, the matter of the carriage of farm produce to the South. At the present time they were suffering from insufficient shipping facilities. They were producing great quantities of tomatoes, but the facilities for taking them away from Bowen were altogether inadequate, so much so that their shipments of tomatoes and cucumbers frequently arrived in the Southern markets in a very bad condition, resulting in losses annually of many hundreds of pounds. Another question which affected them was the one of marketing, and there was no doubt that something ought to be done with respect to the opening up of markets for citrus fruits oversea. He agreed with Mr. Gulliver that the Government had not done as much as they might have done in this matter. A good deal could be said regarding the unsuccessful shipment sent to England by the "Hector." The Government Expert is reported to have said that he was aware it would be a failure before it left Queensland. If so, it was a pity that it should ever have been allowed to leave their shores, as it was a bad advertisement for the fruit industry of the State. With regard to damage done through clipping the fruit with the cutting shears, that might be obviated by using an up-to-date instrument. What had been said concerning the handling and packing of fruit was quite correct, and if they wished to receive remunerative returns they would have to see that their fruit was packed and handled in the best possible manner. The Messrs. Smith Bros., for example, had established a name for themselves which assured them a ready sale for their fruit whenever they placed it upon the Melbourne market.

Mr. B. T. McKay (Maryborough) hoped that the fruit industry had not got to such a low stage that it would have to go to the Government for assistance. With a view to help in sending the industry along, the Government had granted the directors of the Citrus-growers' Association passes for some three years, to attend periodical meetings in Brisbane, with the object of

getting the fruit-growers to combine for mutual benefit, for it was not Government assistance that was wanted by the orchardists, but combination, and of all the difficult men on earth to combine the fruit-grower easily took first place. Until they did combine, however, and give up striving after their own little private ends, they would never really succeed in putting the industry on a firm and profitable basis. No one could say for one moment that he had been an advocate of the shipment of oranges by the "Hector." Their chairman that day, when some of his (Mr. McKay's) co-directors on the Citrus-growers' Association went to the Minister to ask for what was practically monetary assistance in completing the shipment, told them quietly he could not understand how they wanted to ship by the "Hector" when one of their body, Mr. McKay, had reported so adversely on a large shipment that had gone to Melbourne. Mr. McKay had gone down just previous to the "Hector" shipment with 2,000 cases of magnificent fruit, but when he saw it landed in Melbourne, he saw that it was improbable that an English shipment would be a success. Certainly he did not in any way advocate the shipment by the "Hector." Even at that hour, however, combination might have made the shipment a success. All those oranges should have been shipped by and passed through one man's hands, but each man insisted on packing his own fruit in his own way, and on that fruit being kept distinct from the rest of the consignment. The mandarins were certainly quite rotten on the arrival of the "Hector" in London, and the captain afterwards told me that he had no doubt in his mind that it was the mandarins that condemned the whole shipment. The other oranges arrived in very fair condition, but the condition of the mandarins prejudiced buyers against the good fruit. Another complaint made was, that the oranges arrived in a horrible shape in London. Most of them were quite square, owing to having been too tightly packed. The shipment was a failure from a monetary point of view, but it was a splendid object lesson. It taught them that they would have to combine, and, if they were sending any more shipments, to accept and act on the advice of those who knew more than themselves. They would never succeed if they had to depend upon the assistance of the Government. If they sent oranges to England, they would always be able to get a firm to find the money for them. In the case of the "Hector" shipment, the association had arranged for a shipment of 3,000 cases, and were called upon to pay the freight beforehand. The association had practically no money, and they cabled to the agents in England who were going to take the fruit. The agents cabled and advanced the money for 2,500 cases, but the association had to take space for 3,000 cases on the "Hector." There was, therefore, a certain amount short. The association paid over to the shipping company what the English agents had advanced, and there being still a shortage of £37, one of the directors applied to Mr. Denham for the Government to advance it. The speaker was very glad to be able to say that Mr. Denham declined. Although they had to pay the £37 for the unused space, they, having learned that the space was sold in Melbourne, made representations to the Brisbane office of the shipping company, with the result that the manager there wrote to his principals in London, who at once cabled instructions that the £37 should be refunded to the association.

Mr. W. G. WINNETT (Beenleigh) pointed out that the "Hector" shipment had been sent away at a most unfavourable time. Up to the time of the collection of the oranges for the consignment, it had been raining almost continuously for three months.

Mr. D. MACBRAIR (Sunnybank) mentioned that on one occasion, when sending a small shipment of blood oranges from Malta to England, he instructed the person from whom he purchased the fruit to leave on a bit of stalk with leaves on. Three months afterwards, in England, he saw the oranges in perfect condition. He had heard that fruit with the stalks attached might be kept longer than ordinarily by dipping the ends of the stalks in hot wax; perhaps an experiment in a similar direction might be worth the attention of pineapple-growers.

FIFTH MEETING,

TUESDAY, 16TH MAY, 1905, AT 7.30 P.M.

THE QUEENSLAND FRUIT INDUSTRY.

[By ALBERT H. BENSON.]

Unfavourable seasons, low prices, congested markets, over-production of certain lines, the difficulty of getting our fruits to distant markets, the prevalence of pests, and the decreased purchasing power of the community, have, I am sorry to say, caused some of the fruit-growers of this State to doubt the stability of the fruit-growing industry and to consider seriously whether it will not be better for them to give up fruit-growing and try some other branch of agriculture. Before coming to a decision, however, I consider that it will be well for such growers to take into consideration the reasons of the present unsatisfactory condition of the industry with a view of determining—

1. What are the causes of failure?
2. Can these causes be overcome or ameliorated?
3. What other branch of agriculture can take the place of fruit-growing with a reasonable prospect of success?

In my opening sentence I have briefly enumerated some of the causes of failure, but these are by no means the only ones. Failure on the part of growers to realise the fundamental principles governing the successful cultivation of fruit has a great deal to do with the unsatisfactory condition of the industry. The selection of unsuitable soil; the absence of facilities for marketing; the planting of unsuitable or inferior varieties of fruit; the neglect of systematic cultivation, pruning, manuring, destruction of pests; careless handling of the fruit when grown; indifferent packing and injudicious marketing, have all a very strong influence on the ultimate returns obtained from the orchard. The remedy for all these causes of loss is in the hands of the grower himself, to a very large extent, and he will have to depend mainly on his individual exertion and common sense. At the same time, there are other causes of loss which cannot be met by individual action, but must be fought systematically by an active commercial co-operation of all growers working together for the good of the industry generally.

This is the particular phase of the industry which I purpose dealing with now, and to bring once more prominently before the growers of this State, as, in my opinion, it is the only possible means of placing the industry on a satisfactory basis.

This is by no means a new idea of mine, as I have seen the necessity for co-operative action ever since I came to Australia, and when, only some six months in this country (in November, 1892), I wrote an article for the *Agricultural Gazette* of New South Wales on "The Advantages of Co-operation in the Selling and Handling of Fruit," an article that was very favourably commented upon at that time. The principles I then laid down I have stuck to ever since. What I then wrote in New South Wales is applicable to Queensland to-day, as fruit-growing in this State is in a critical condition—a transition period—when the supply has overtaken the demand of the immediately available markets and others have not been secured or even exploited. This is a condition of the industry that has been met with many times before in various parts of the world, and one that has been successfully overcome by combined action. Are our growers so backward and so obstinate that they will not take advantage of the experience of others? I trust not. I believe that once they fully realise that the future of the industry depends not on individual action, but on the active co-operation of all growers, such co-operation will become an accomplished fact, and the industry will be placed on a firm basis.

In order to show the value of co-operation and the necessity for its establishment, I think I cannot do better than quote from my article in the *New South Wales Agricultural Gazette* for November, 1892, previously referred to, as what I then stated stands good to-day, and has been preached by me from many a platform in this State—

"In the first place, the fruit-growers are largely to blame for the present state of affairs, as in years past, when the demand for fruit was very much in excess of the supply, they obtained good prices and could dispose of any rubbish.

"In consequence of this, many growers did not take sufficient care of their orchards and sent, and are yet sending, a large amount of inferior fruit to market. Now, with a largely increased production, this inferior fruit is more or less difficult to sell, and tends to cause a glut on the market.

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"Again, when fruit-growers were obtaining good prices, they did not notice the large profits being made out of the fruit by the middlemen. But, now that there is an over-production, or rather a want of distribution, of certain fruits at certain seasons, causing a heavy fall in price, and the middlemen naturally objecting to smaller profits than they had been accustomed to, the loss falls on the grower, who, after all expenses have been paid, frequently finds himself out of pocket, or obtaining so small a price that it is impossible for him to grow the fruit at a profit. The remedy for this unsatisfactory state rests entirely in the hands of the growers themselves. In the first place, fruit-growing, in order to be successful, must be conducted on business principles, and not in the slovenly, haphazard manner one frequently sees. It requires all the attention a man can give to it, and the better the trees are looked after the better fruit they will produce, and the better they will pay. Only such varieties should be grown as are best adapted to the soil and district, and the number of varieties of any one kind of fruit should not be excessive, none being grown unless possessing especial excellence. It takes just as much time and expense to grow an inferior tree that will only produce inferior fruit as to grow a good variety that will net the grower a handsome return. The common habit of planting any fruit tree to be found in a nurseryman's catalogue in one orchard is a great mistake, and must necessarily end in failure and loss, as, in addition to a large proportion proving worthless, or practically so, the grower never has sufficient of any one variety to make it worth the while of the wholesale man to handle his fruit."

(The experience of this State—Queensland—is that the planting of inferior, worthless, or unsuitable varieties is one of the best, if not actually the best, means of propagating all kinds of fruit pests.)

"Fruit-growers should unite to dispose of their produce so as to obtain the best possible market, and bring themselves and the fruit consumer nearer together. This can only be done by co-operation. . . . The benefits to be derived from co-operation are so evident that it seems strange that fruit-growers are so reluctant to take any steps in the matter. One great result that would be obtained by fruit-growers uniting would be the increased facilities for the distribution of fruit, thus preventing in a great measure a glutted market. I have no doubt that if good fruit can be placed before the consumers at anything like the price obtained by the producers, there will be a very much larger home consumption; for in a climate like this fruit should be one of the necessaries, and not, as at present, one of the luxuries of life. Fruit is Nature's great medicine, and it should be on the table of everyone at least at one meal during the day. By co-operation it is possible to utilise all the fruit grown, as after supplying the fresh fruit trade the balance can be used for canning, drying, or jam-making.

"The only means by which it will be possible to build up a large and successful export fruit trade with Europe is by concerted action on the part of our fruit-growers. New South Wales is likely to be left out in the cold unless our fruit-growers bestir themselves in the matter, and so obtain a share in the market whilst there is still time." The article further deals with the question of central packing houses, canneries, &c., all to be run on co-operative lines—in fact, as already stated, it to a large extent covers our requirements to-day, though written nearly thirteen years ago.

I see no reason for altering my views now, and am more convinced than ever that they are the correct ones—and, further, that it is essential that they be carried out. Now, how is co-operation going to help the fruit-grower? Surely this should need no further explanation, but be evident to every thinking man. Unfortunately, all fruit-growers—and not only fruit-growers, but other agriculturists—are not thinking men, prepared to judge an innovation from an impartial standpoint, but are so wedded to individualism that it is an exceedingly difficult matter to make them see that any system that produces the largest amount of good for the greatest number is of infinitely more value to the industry generally, and to the State as a whole, than that which is summed up in the old saying of "Every man for himself, and the deil tak' the hindmost." Agriculturists all over the world, and particularly in English countries, are strongly conservative, and adverse to any innovations. The theory of "What was good enough for the father is good enough for the son" is still, in many cases, looked upon as an essential article of faith, not to be set aside by any new-fangled ideas. The world, however, moves quickly nowadays, and progressive agriculturists find that unless they wish to be hopelessly stranded they must move with the times. In no branch of agriculture is this more essential than in that of fruit culture, as the changes during recent years have been so rapid that the very existence of the industry commercially is dependent on its being kept right up to date. Competition is getting

keener day by day, and, with the general adoption of cold storage for all classes of fresh fruits, we now find that our markets are being supplied in the off-seasons with many kinds of fruit grown on the other side of the equator. Surely this is a lesson to us, for if their fruits will carry from them to us, there is no reason why the same varieties grown by us should not be sent to them, so as to reach their markets in their off-season, provided always that we take as much trouble in the handling, selection, grading, and packing of the fruit as they do.

It is not only outside markets that we must look to. Our own Australian markets are by no means exploited yet. Our capital cities are, no doubt, well supplied with fruit, and at certain periods of the year over-supplied; but, whilst this is so, there are many places that have a very inadequate supply—so much so, that the prices asked are so high that the consumption is reduced to a minimum, and fruit is often out of the reach of any except the wealthier portion of the community. Even in our larger cities the usual price of fruit to the consumer is out of all proportion to that obtained by the grower, and this tends to greatly limit consumption. In the better distribution of our fruits and the exploiting of our own markets there is ample scope for co-operation, as a better state of affairs will never be brought about by individual enterprise. We must get our fruits onto all our available markets, and must sell them there at a price that will tend to a large increase in consumption. This will absorb a large amount of our surplus, and if backed up by the opening of oversea markets and the utilisation of our surplus product by canning, drying, or otherwise, will put our fruit industry on a sound footing. I may be told that this is all very well in theory but it is impossible to be carried out practically. Make no mistake—others have done it before, and it can be done again. We have already had some experience in co-operation in fruit-selling in this State, *videte* the work of the Citrus-growers' Association. This association has undoubtedly done good work as far as it has gone, but in my opinion the time is now ripe for a wide extension of its work, so that, instead of being a co-operative distributing agency for fresh fruit to the capital cities of the South, it should take up the whole question of fruit distribution and utilisation. In other words, it should become a powerful organisation, having capital at its back with which to open up and supply our own and oversea markets with fresh and preserved fruits. Such an organisation would handle our fruits at a minimum of expense, would be able to distribute or utilise them to the best advantage, and, further, it would control the Australian market for those fruits whose cultivation on a commercial scale is confined to this State. Such an organisation should have at its head the best business brains that can be obtained for money, and should be run on the soundest commercial lines. It should keep in touch with the fruit markets of the whole of Australia and the principal fruit markets of the world. It should regulate the distribution of fruit, and keep track of it from the orchard to the consumer, so as to get it to the latter in the best condition and at the lowest possible cost. Such an organisation is absolutely necessary before we can build up an export trade, as it would prevent mistakes such as those made in the shipment by the s.s. "Hector" last year, as nothing would be exported that was not up to a definite standard of excellence, and it would be got up to suit the particular market to which it was to be sent.

There are enough fruit-growers in this State to make a co-operative organisation a success, and the necessary capital could be raised without unduly bearing on individuals. The management should be in the hands of the growers themselves, and the men chosen as directors should be fruit-growers having a keen personal as well as a financial interest in its success. The success of co-operation depends on the surrender of individualism, as every grower who becomes a member of a co-operative body is simply a unit working with others for the good of the industry. There may be cases where this may seem to be hard on the individual, but, granting that this is so, I think I have shown pretty clearly that the old system of every man doing the best he can for himself has had a fairly long trial, and under existing conditions is not at all satisfactory. It is time to make a change, even though there may be some who will suffer at first, as united action is bound to produce better results than where everyone is pulling a different way.

By no means the least important phase of co-operation is that, when carried out in its entirety, it not only assists its members in the distribution or utilisation of their raw products, but every article required for the successful carrying out of their work—such as implements of culture, manures, spraying and cyaniding outfits and the chemicals required for same, fruit cans, &c.—can be purchased cheaper collectively than individually. In distribution and utilisation, the principle should be that as few persons come between the grower and consumer as

possible, and the profits should be kept in the hands of the producer, and not eaten away bit by bit by every agent through whose hands the fruit passes, till finally the remnant that is returned to the producer is so small that it often fails to pay for the cost of production.

The fruit-growing industry has been a good asset to the State in the past, and has supported a by no means insignificant proportion of our population, and though the outlook has not been as bright recently as could be wished, there is no reason to lose heart in its stability. I feel sure that once growers realise the change that is taking place they will do their utmost to place the industry on a firm basis, and that, instead of going back, it will go forward steadily, and become a much larger source of wealth to the State than it has been hitherto. I know of no industry to take the place of fruit-growing in the districts that are particularly adapted to fruit growth that will have any greater chance of success than fruit-growing, so that I say again to those who are beginning to doubt the stability of the industry: consider the matter carefully before deciding on any serious action, and try and see if you cannot pull together with other fruit-growers, agreeing to sink self and petty jealousies, and throw in your lot with others for your own personal good, the good of the industry, and the benefit of the State.

DISEASES IN PINEAPPLES.

Mr. C. F. M. FISCHER (Zillmere): This is an old subject, and although I am introducing it, it is not because I have solved the problem of the cause of the disease and its prevention. I dare say all those who have grown pines in the various districts in Queensland have encountered the disease, and it seems to be spreading. The pineapple is a hardy plant in the localities to which its cultivation is adapted. It is a fruit the taste for which grows on the palate, and there is always a good demand for it. Our consternation can therefore be imagined when this trouble arose and swept out of existence whole plantations, and which ultimately, in many cases, caused people to throw up their holdings in utter despair. I am sure that, so far as was in their power, the Government experts have done all they could to find out the cause of this disease in pineapples, and also the remedy, but I am sorry to say that up to the present there has been no satisfactory solution arrived at as to the cause of the disease. Mr. Soutter, when he was at the Acclimatisation Society's Gardens, made a number of experiments, and, as a result, expressed the opinion that it was not a matter of one cause, but of a combination of causes. I quite agree that it appears to be so, for there are many theories among the farmers as to the cause of the disease. Although many of us have not the brains nor the time to make the necessary observations, yet we have arrived at more or less satisfactory conclusions on many matters concerning the trouble. At any rate, the growers who have been so unfortunate as to lose large areas have been trying to find out what the cause of this disease may be. I, myself, however, may say, that I have not yet arrived at any one single theory which will hold water, and to which great exception cannot be taken. In the first instance, it was believed that the disease was explained by what was known as the "wet theory," and it looked very feasible, because it was after the big flood in 1890 that we began to notice the pines dying off to any extent. The disease was, therefore, attributed to the heavy rains that we had experienced. I had seven or eight acres under crop at Zillmere, which meant a comfortable existence for an agriculturist. The plants were just bearing nicely, and I tried to save the plantation by going in for draining. But although I hung on for a year, I did not save the plantation. The plants went bit by bit, until, after a number of years, I lost every one. We all know what is the matter. The root of the plant is dead. You can take whole clumps of pines that have spread over a large area and lift them out of the soil with your hand. That is the Dry Rot. In that case, the plants simply become yellow, and gradually die. At first they give an inferior fruit, but one good in itself, for the pineapple that grows on a diseased stalk is generally sweeter than one that grows on a healthy stalk. The "wet theory" as the cause of the disease had a good deal to support it, but, as said before, in my own case, it did not provide a remedy. Some held, however, that the drainage should have taken place

before the disease appeared, and thereby act not as a remedy, but as a preventive. Still I knew many who drained their land prior to planting with pines, but after a few years their fields also fell victims to the trouble. Some observers claim that the disease is due to exhaustion of the soil, but that does not altogether commend itself to us. Moreover, the disease which is called "wet rot" generally occurs on fresh ground, which has been newly broken up, and on plants only about two years old. Another theory was advanced that the disease was caused by unsuitable manure. We were told that sawdust manure, which was commonly in use, was the main cause of the roots dying off. But, lately, I have heard that someone from Mount Cotton has discovered that it is not caused by sawdust or stable manure, but by the artificial fertilisers which are largely used at Mount Cotton. How all these theories can be reconciled is beyond my comprehension. I attempted pineapple-growing again, and succeeded well, after a spell of four or five years, on the same piece of land. But after three or four years they began gradually to fail. I filled up the spaces with smooth leafs, and they seem to stand the conditions pretty well. In fact, numbers are putting in smooth leaf pines as fast as they can get plants. The smooth leaf pines suffer, but, apparently, not to the same extent as the rough leafed variety. A peculiarity of the disease is the immunity some pineapple fields seem to enjoy. At my father's place the pines are in splendid condition. Some of the rows there are twenty years old, and are still producing good fruit. Perhaps Mr. Benson may have made observations with respect to the pineapple diseases in his travels throughout the different fruit-growing districts, which may be of service in finding out the cause of the trouble.

Mr. H. Heinemann (Redland Bay): The cause of the trouble described by Mr. Fischer is, in my opinion, want of drainage. The presence of stagnant water underneath the surface soil is the reason, and land with a clay bottom wants draining. I am quite prepared to take a so-called diseased pineapple plant and grow a good plant from it by putting it in suitable soil. I have had pineapples growing for twenty years, and would advise anyone who finds his plants dying to look in the soil for the cause. Sometimes a strip of diseased plants will be found running through a pineapple plantation, and if the matter is thoroughly investigated, it will probably be found that there is a seam of clay running through the field. The drainage runs towards that clay, and stagnant water is collected, with the result that the plants in the immediate vicinity become "diseased." In proof of this, I may mention that the plants become most affected in winter.

Mr. B. T. McKay (Maryborough): I am sure there is no disease in pineapples. In the way of immunity from disease, it is the one sheet anchor that the fruit-grower can rely on. But it is a fruit that must be planted with brains, and whoever has studied the pineapple must know that it must have a warm subsoil. To attempt to grow pineapples in clay, unless it is thoroughly dry, is courting failure. Moreover, however wide the pineapple may grow, it has really only one root, but down in the Zillmere district, I notice the pineapples are allowed to grow wider and wider every year, and as long as pineapples are allowed to grow in that condition they will deteriorate. It stands to reason that if plants grow eight feet wide they must give inferior fruit, and ultimately die from sheer exhaustion. In fact, exhaustion is the real cause of the trouble. Mr. Benson advised me never to allow more than three or four suckers to a plant, and although I do not get as many pines per acre as they do at Zillmere, still, while the growers there can sometimes get thirty pines into a case, I can generally fill my cases with thirteen fruit. Big pines pay better than little ones. They require less handling, and when they get to market they are a credit to Queensland, whereas many of the pines that I see going south are a disgrace to the State.

Mr. J. C. Brünnich (Agricultural Chemist): I may state that in the last annual report of the Department of Agriculture appeared a very full account

of my preliminary investigations with regard to this disease. To those who have not seen the report, I may say that the figures contained therein are simply astounding. The disease has been under observation for a good many years, and the results of my experiments corroborate completely the opinions expressed by both Messrs. Benson and Tryon at various times. A few extracts from the report will show what a pineapple crop takes from the soil in comparison with, say, cane. The actual weight of the whole pineapple crop is incredibly high, particularly in old fields, and it is almost inconceivable that one field can carry a green crop of 300 tons per acre, containing 250 tons of water, equalling 2½ inches of rain, 48 tons of dry substances, which contains over half a ton each of nitrogen and potash, and a quarter of a ton of phosphoric acid. We all know that in the Brisbane district the method of planting pineapples is in rows 8 or 9 feet apart. Many of the farmers down about Nudgee and Zillmere let the pineapples grow until these rows nearly meet, and, consequently, they accumulate a mass of vegetable matter. I obtained figures dealing with the tax of pineapples upon land from other countries, including the Mauritius, and they agreed very closely with my own. Now, an average sugar-cane crop is 30 tons per acre, but the smallest pineapple crop I could find gave at least 60 tons per acre, while, as already said. some went up to as high as 300 tons per acre. I analysed not only the leaves and stalks, but also the roots and the fruit. For the fruit, average weights were obtained by weighing several fruits from various parts of the field, and to estimate the weight per acre, an actual crop of a thousand dozen per acre was taken in all calculations. An average crop of a thousand dozen per acre annually is a fair thing for a healthy plantation, although this is not obtained in the first or second year after planting, a good first year crop being from 5,000 to 6,000 pines. In the second year, you can expect one pine from every sucker, but in later years the proportion between the number of pines and suckers becomes more and more unfavourable as the plantation gets older, due to the disadvantage of the system of planting in rows, as compared with the check system used elsewhere. Thus in one field we found that by taking a crop of 12,000 pines, only one sucker out of twelve bears a fruit per annum. This, of course, simply means that out of twelve suckers in a field you have eleven which are doing nothing but simply exhausting the soil. It stands to reason that it is ruinous to your soil to obtain fruit with such a waste of material. From an American report we ascertained that in a pineapple plantation, planted on the check system, 18 inches by 18 inches, having thus 19,360 plants per acre, the first year's crop yielded 5,000 pines, and the second year's crop 12,000. When I examined the diseased pineapples I found, as has been stated by the gentleman who introduced the question, that you could easily kick over the plants with your foot, and found that even in the case of healthy plants the roots were only two or three inches below the surface. In the first and second year after planting, the roots of the scion in the original row may go down to a depth of from 10 to 16 inches; as soon as the plants get older, the lower roots decay, which is common to many plants. In the case of the actually diseased plants on the old-established fields, the roots stocks were found lying loosely on the ground; to this was added decaying green material. the whole forming a mass of organic matter in a high state of fermentation, which resulted in a complete souring of the soil. I took samples of the soil in which the plants were lying, and found them particularly acid. There can be no doubt that under exceptional climatic conditions and drainage you may succeed in getting crops for several years. The trouble, however, when it does come, should not be called a disease proper, for it is rather a peculiar physiological condition of the plant, due to unfavourable conditions existing in soil and subsoil, for if, as Mr. Heinemann pointed out, you plant a "diseased" pine in healthy soil, you are pretty certain to get a healthy plant, thereby clearly showing that the soil is the cause of the trouble, and not the plant. In fact, many of our so-called cane "diseases" are also really due to an exhaustion of the soil, and a falling-off of the supplies of plant nourishment. Of course, the investi-

gations that the Department of Agriculture and Stock is pursuing, with respect to the pineapple disease, are by no means finished, and you must understand that this is only one of the many similar points that come before the Department. Mr. Benson and myself are endeavouring to find out what manure will be most effective in counteracting the drain on the soil upon which pineapples are growing, and I hope that some satisfactory results will be achieved. Unfortunately, however, agricultural experiments have very often to be extended over a series of years before definite conclusions can be arrived at. Still, we arrived already at one definite and useful fact, which is, that pineapples are about the most exhausting crop that can be grown upon land.

The Chairman: I am sorry to say that I have observed a good deal of indifference on the part of producers with respect to the results of the investigations carried out by the Government. The apathy shown is simply astounding. Only recently the Registrar-General informed me that, as a result of a number of inquiries he sent out to producers for information that he desired in connection with his returns, the replies he got were so few in number that it was impossible to compile any definite data thereon. Yet the information he wished to collect would, when bulked, have been of the greatest value to those who ignored his application for assistance in compiling it, even though they were given every facility to send it along. The Agricultural Department wished to collect reliable data respecting the suitability to the different wheat-growing areas of the State of the varieties of wheat imported into Queensland from South Australia in 1903. Circulars, with carefully prepared questions, were sent to those who had received these wheats, but the replies were very few and very disappointing. The Department exists for and on behalf of the producer, and I may say, concerning the staff in that Department, that I believe it to be as zealous, as capable, and as indefatigable as the staff in any office in any part of God's universe. I regret that our means do not permit of despatching the departmental officers more freely to the different parts of the State. Our resources are, however, limited, and it is a hard matter to get on the Estimates just what we want. But still, in respect to the Department of Agriculture, I do think that, if we increase the expenditure on it, it will return to the State a hundredfold. (Hear, hear!) Following along this pineapple business, I shall ask Mr. Benson for the results of his experiments in cold storage, in order to see if it is possible to get the pines on to the oversea markets. Recently pineapple experiment plots have been selected in the Nudgee district, analysis made of the soils thereon, and manures calculated on the results of the analyses applied. In the course of a few months we should know the first results of these experiments. We hope, by and by, to be able to show not only how to grow the best pines, but also how to market them, but we do want co-operation from the growers. It occurred to me, while Mr. McKay was speaking, that possibly the grub-worried sugar-cane may in some degree be compared to the pineapples growing on worn-out soil. I believe it is in the fourth and fifth ratoons in which the grub is found to be the worst, and I understand Dr. Maxwell is of opinion that it is undesirable to go beyond the third ratoon. This grub question is a serious one to cane-growers, and the fact that the pest finds its weakest prey in old ratoons is worthy of the earnest consideration of planters.

Mr. A. H. Benson (Instructor in Fruit Culture): Mr. Heinemann hit the nail on the head with regard to the so-called pineapple disease. It is not a disease, but is due to the improper condition of the soil. The pineapple is a plant that, in its native state, grows on rocky soil or broken coral on the borders of the sea coasts of tropical America. There it has for its conditions a perfectly natural drainage. The soil is warm, and the plants get their roots right down into it. There they do not have any disease. When you have a sour subsoil, whether natural or owing to the presence of too much clay in the ground, or by seams of clay, or any other cause that produces a sourness or coldness, or retention of cold water, or by the presence of too much organic

matter, then any, or a combination, of these things will cause the pineapple plant to die. I can bear out what Mr. Heinemann said with respect to pineapple suckers. Mr. Mitchell, at the Acclimatisation Gardens, took suckers from the rottenest plants he could get, placed them in good soil, and raised healthy plants from them. That is absolute proof that there is no disease in the plant, for you could not produce a healthy plant from an unhealthy sucker if disease was going through the plant. The disease is distinctly dependent upon the condition of the soil on which the plant is grown. I may tell you plainly that where I have come across conditions absolutely adapted to the growth of the pineapple I have found no disease. In a series of articles that I wrote for the *Queensland Agricultural Journal* on pineapple culture, I laid particular stress on the absurdity of the present method of planting and growing pines. The growers about Brisbane make their rows for pineapples 9 feet apart, and yet they will put the suckers in the rows as close as a foot apart. Can any one tell me why a pine wants 6 inches in one direction and 4 feet in another? In these rows there is only one original parent plant, the offshoots being simply ratoons. The latter only scratch the surface of the soil, so that, when the old plant goes, there is nothing for the rest to hold back on to. In all up-to-date countries where pines are grown on scientific lines, the planting is done generally on the check system, where every plant gets its own bottom to stand on, and the plants are never allowed to remain in the ground more than, say, five years. The principle adopted in those countries is to raise a good pine that can be shipped. We, however, have been going in for quantity at the expense of quality. In practically all the old plantations about the Nundah and Zillmere districts, if you want to get a good pine, you go for it to the outside of the row and not in the centre. What I would suggest to our pineapple-growers is to spell, renovate, and renew their land. It is the young plants that produce the pines that are a credit to Queensland, and it is the old plants that produce a fruit that we cannot secure a market for. Such fruit is absolutely worthless as a commercial commodity. The chairman has asked me to say a few words showing what has been done in the matter of the cold storage of pineapples. We carried out these experiments very carefully. In 1893 a series of experiments was carried out, extending from February to August, with the cold storage of all kinds of fruit. I came up North the other day with the manager of the Bowen Meatworks, a gentleman who, with another from Tasmania and myself, were the persons who in 1893 conducted these fruit storage trials. We never got much credit for them, but I may tell you that the result of those experiments has been the basis of the whole cold storage of fruit system on earth. We went in for a system of lowering the temperature considerably, and keeping a free current of fresh air in among the fruit. We met with one considerable difficulty with pines. The pines were off-season pines, and were, unfortunately, full of water. We found that among the pines, even after six or eight weeks, that there were one or two that kept in excellent condition. A number of others developed blue mould. This mould caused a curious fermentation of the sap, and rendered the pines practically useless. The pine is an extremely difficult fruit to deal with in cold storage. If you bring it below a certain temperature, it sets up an acetic fermentation; if you store it at too high a temperature, it develops blue mould. I feel pretty certain that it would be possible by an antiseptic treatment to prevent the formation of mould, but I do not see, unless we get a more direct system of communication between here and London, that we will be able to profitably reach the European markets. I see no reason, however, if our pines are properly treated and kept at about 34 degrees Fahr. (never below it), why we should not be able to land our pines at San Francisco or Vancouver as easily as we can land them at Sydney. Patience, however, is required, and it should be remembered that the Tasmanian fruit trade was not built up in six months. By our failures we shall be able to find out how to send our pines abroad. Though we partially failed once, we shall not necessarily fail next time, and it is possible we shall succeed. The experiments I have alluded to were, in one or two

instances, successful. The curious thing was that, of two pines picked on the same day and kept in apparently the same manner, one turned out well and the other wrong. We must find out the little thing that was the cause of the difference, and when we have found out that, we have solved the problem of the cold storage of pineapples. As Mr. Brünnich has already advised you, that gentleman and myself are collaborating in the carrying out of a series of comprehensive experiments for the manuring of pineapples. We are trying the experiments on different soils, have applied the manures carefully, and we shall watch the results carefully. For those results, however, you must not look too soon. The results of manurial experiments are not visible within the course of a few days, for, as a matter of fact, they must be carried over a series of at least two or three years. One single experiment is not conclusive. You must have experiments on several different farms, at several different places, and over two or three years, in order to be able to arrive at a definite solution of a difficulty. I feel certain that we have been hitherto, in Queensland, manuring our pines in an absolutely incorrect manner. Mr. Brünnich tells us it takes 1,200 lb. of potash per acre to grow a maximum crop of pines. Practically, however, with the exception of horse manure, we have not been putting back a pound of potash to our pineapple soils. Some eight years ago we had a little experiment orchard at Redland Bay, and then initiated a complete series of manurial experiments. Unfortunately, those experiments were not continued, or I would not now be in the unfortunate position to-day of telling you that we have still to learn what are the best manures for pineapples on Queensland soils. The present series of experiments, however, in the Nudgee and the surrounding districts, has been carefully started. Careful notes have, and will be, taken, and the results will be given to every fruit-grower in Queensland who desires to be informed of them.

Mr. C. F. M. Fischer (Zillmere): At one time I arrived at the same conclusion as Mr. Heinemann with regard to the lack of drainage being the cause of the disease in pineapples, but I now doubt whether the "wet theory" solves the difficulty. Since the loss of my first plantation, although I have any amount of ground at Zillmere, I have looked upon it as hopeless to try and grow pineapples there. I have, however, taken a place at Cribb's Island, at Sandgate. There is good soil there, and the temptation was, that we could grow the pines without manuring. The soil is of good depth, and, in some places, you can go down more than 8 feet. There is any amount of shell there mixed with the soil, and although we have had plenty of rain since I cleared the land four years ago, there has never been sufficient rain to make the land too wet. The pines grew splendidly for the first two years, and my hopes ran high. After the third year of their planting, however, the pines started to go all over the place. I had planted them in what appears to be ideal soil, and under ideal conditions, and yet, though now only three years old, they are beginning to fall victims to the disease. It is generally after the winter that they begin to go. Many years ago I tried the experiment of closer planting, and the planting I am doing now is at 6-foot distances.

Mr. T. Hall, of Mooloolah Farmers' and Fruit-growers' Progress Association, on behalf of Mr. H. Goodwin, then read the following paper on—

OUR SYSTEM OF MARKETING AND HOW TO IMPROVE IT.

[By H. Goodwin.]

There seems to be a general feeling among fruit-growers in this locality, and probably the same feeling exists elsewhere, that the present system of fruit distribution is faulty, and, thinking that the subject is one of the greatest importance to producers, the writer hopes that the matter will be so fully discussed at this Conference that perchance some practical scheme may be the outcome.

In my opinion, co-operation will prove the remedy. I say *will*, as there is little doubt but that it will come in time; but why wait? Why not make a start now, and so improve our present condition?

As for the present system, take Roma Street Fruit Market. I send my fruit to one salesman; my neighbour sends his to another. The salesmen are possibly selling our two lots of fruit at the same time to two small groups of buyers. Under such conditions it is impossible to obtain a fair market value. I may state that the bulk of the fruit imported into the London market was in the first place auctioned by two firms. I am speaking of some twenty-five years ago, and I believe the same conditions hold still here in Brisbane—we have to support a small regiment of salesmen. Is there any reason why the fruit-growers should not combine and have their own agency in Brisbane? Is there any grower who does not believe that under these altered conditions he would obtain a fairer return? The Brisbane management could fix the price for the ensuing week or longer, and, being the holders of the available stock, could demand a fair price. I think that if a capable canvasser were employed to interview the growers at the different fruit-growing centres, pointing out to them the advantages of pulling together, surely very few would remain outside such an association. What is to prevent an association of this sort, with headquarters at Roma Street, acting as agents for a similar association in the Southern States, and they acting for us? I believe that if the Queensland fruit-growers could be gathered together, and the whole matter be placed clearly before them, an association could be placed on a sound footing in a very short time. Should the great majority of the growers consider that a scheme on these lines would be beneficial, surely a capable organiser could be obtained who would bring it to a successful issue. Of course, this means that we should have to put our hands in our pockets; but, judging by what is done in America and elsewhere, the outlay, compared with the benefits derived, should be a mere bagatelle.

Mr. B. T. McKay (Maryborough): I find, talking of the question of the marketing of fruit, that a great number of the speakers here this afternoon depress one who is growing fruit. To my mind, it is evident that most of them know nothing about fruit trees. Probably they have a few orange-trees or a couple of loquats, all in a state of disease. If a man has to make his living by fruit, he has to follow the calling in a systematic manner, and the first thing he must decide is, where is he going to sell his produce? The matter of varieties is a very important one. Do not put in five each of about a dozen different varieties of oranges, but put in a hundred trees of one sort. Then you can always supply two or three cases of the same orange. I have no variety of orange with such a small number of trees that I cannot supply, in the season, a respectable case of fruit of that variety. Attention to such points and many others goes to make up a successful fruit farm. But, for men to come and speak here, who have ten or a dozen trees in a state of disease, does a good deal of harm to the industry. The chief thing, however, that has brought me to my feet is the question of the railage of fruit to Melbourne. Unfortunately, the matter has not been properly explained. I have had it in hand for two years, and may say that with us it is not a matter of money, but a matter of time. The time the fruit takes to go from Maryborough to Melbourne is the difficulty we wish to overcome. The question of the cost of carriage is a secondary consideration. The Railway Commissioner, Mr. Thallon, is prepared, if we send quantities of fruit, to send a special train from Maryborough to Wallangarra to carry fruit. He has also arranged with the Victorian Commissioner to take the fruit from Albury by the mail train. But he cannot get out of New South Wales any promise to take the fruit from Wallangarra to Albury in less time than five and a-half days. That means it would take ten days for the fruit to travel from Maryborough to Melbourne by train. It takes about the same time by steamer. It seems to me hardly conceivable that the matter could have been put forcibly enough before the New South Wales Commissioner. By such a system we would be able to distribute our fruit *en route* to the various towns and centres in New South Wales, which would be a great advantage to us and to the consumer. They would get our cucumbers and tomatoes out of their season, and, on the other hand, the compliment could be returned to us. The Railway Commissioner has given us a freight of 2s. 2d. per case to Melbourne. It would pay us far better at that rate to send the fruit by rail, for the simple reason that the oranges passing through the

air in a ventilated car would travel under the best conditions under which oranges can travel. This question of sending fruit to Melbourne overland is one of time, and for the benefit of the contents of the cases, although I must admit it is very difficult to get the ordinary farmer to understand that it would pay him better to send oranges to Melbourne by rail at, say, 2s. 2d. per case, than by sea at 1s. Combination, however, must come in here. You may find thinking men who are prepared to send their fruit to the southern markets by rail, but that appreciation of the benefits of adopting such a means of transport is useless without combination, in so far that the railway authorities say you must send truckloads; and, in the present state of the fruit industry in Queensland, the growers must combine to find truckloads. All along the line, every branch of agriculture is crying out for combination, but it seems to be the last thing you can get the fruit-grower to recognise. The Citrus-growers' Association began with nothing, and, after three years we have now about £150 to our credit, which is not a discreditable state of affairs. I would not care if we had nothing, if we had our members sticking to us, and I must say we have the greatest trouble from the small grower. The money that is ours is yours, for the citrus-growers can dispose of it as they will. The matter of forming the association into a limited liability company has been before the directors for some time, and, personally, I believe it would be a step in the right direction, for some of our members, if shareholders, might take more interest in it. I should like to explain in two or three words what the association is. We have a secretary in Brisbane, and any man in Queensland, even up North, can send his fruit where he likes to the care of the Citrus-growers' Association. Then, if he advises the secretary, the fruit will be attended to. If you send only one case, you thereby become a member of the association. There is no subscription fee or anything. We have not the funds to do as much as we would wish, but there is one question that we have taken up, and that is, the matter of the glut in pineapples. Personally, I am convinced that we shall never do a trade with England in pines, and I will tell you the reason. The British people build ships for their requirements, and the Dominion Line, running from Jamaica to Liverpool, is carrying pines in millions. They carry them direct from Jamaica to Liverpool in ten days, and it is no use your talking of sending pines to England when they will be from six to seven weeks on the journey. Even if you got them there, I believe the Jamaica people would be able to undersell you. There is a big thing for our pines in England, but it is in the canned form. The pine that I refer to is the smooth-leafed type, tinned whole, and thousands of them are sold in England. Such a pine must appeal to your own senses. A 4 or 5 lb. pine, peeled, turned out into a dish, is a very fair ornament to a middle-class man's table. But as for the small things, I do not think there would be much money in them. Some people say you cannot tin the smooth-leaf pine. Verney and Co., of Brisbane, have, however, kindly given me samples of smooth-leaf pines that had been tinned three years. I had these tried along with some pines taken from the field, and the consensus of opinion was that the smooth-leaf pine which had been tinned three years was better than the pine taken three days before from the plant. Verney and Co. say it is just as easy to tin a pine whole as to tin it in chunks. It only requires a little more boiling. The big business in pines will have to be done in tins. The Citrus-growers' Association has decided to tin 500 cases of pines. We wanted some money to finance this, and first went to the banks, but they refused. It was suggested that we go to our worthy chairman, but I objected. I am a fruit-grower, but I am not a pauper. But I believe by some means or other we shall be able to raise the money to get the pines and send home a consignment. Reverting to the matter of the carriage of fruit by rail, I think that even although Mr. Dunbar has been down south, if some strong action were taken pointing out the advantages to intercolonial trade, it would have some effect in getting what we desired. Further than that, I would ask that perishable goods be carried by mail train. The railway authorities here were horrified when I suggested that to them, but it is

done in England, where the mail trains travel faster and waste less time than they do here. How do they get their salmon fresh in London every morning? They get it every day 400 miles from Scotland. The people of London must have it fresh, and it accordingly has to come with the mail. I now beg to move the following resolution:—"That it be a recommendation from this Conference to the Ministry that their support should be given to intercolonial transport by rail."

The first thing we desire is rapidity of transport, and then the next thing would be cheapness.

Mr. C. Cotterell, of the North Coast Central Association, seconded the motion.

Mr. W. Palmer (Bowen): I am sorry to say that the experience of the Bowen people with regard to the Queensland Citrus-growers' Association has not been satisfactory. When the association was first inaugurated, we sent our fruit through it, but the returns we received did not compare satisfactorily with the returns received from private dealers. The returns received from the Citrus-growers' Association showed a loss of one case in ten, and the advice said "lost in specks." This did not happen in one particular case, but in several. The growers went round about and compared their returns with one another. At this very time we are sending fruit to private firms, and in every instance the fruit has carried without the loss of a single case. In face of this, is it not reasonable that we should discontinue our shipments through the association? We recognise that co-operation is a very grand thing, but if the Citrus Association is going to be carried on as it has been, then it will not get the support of the Bowen people.

Mr. B. T. McKay, in reply, said the losses for "waste" on Bowen fruit shipped by the Citrus-growers' Association were only a fraction on the losses from this cause returned in the case of Maryborough and Blackall Range fruit, and that, therefore, he could not understand Mr. Palmer's complaint.

Mr. C. Cotterell (North Coast): With respect to pineapples, I believe myself that we have heard to-night the true solution of the difficulty in the matter of disease. When you find a plant beginning to decay, or something wrong with it, you can rely upon it that one or two necessary elements are deficient in the soil in which it is growing. There is no doubt that potash is an element that is deficient in many of our soils, and this can be proved to our satisfaction to some extent. Although we may not be experts, we can make a few experiments on our own, and we can come to a conclusion as to what our soil is deficient in, and in what we should apply to remedy that deficiency. I know there are many pineapple-growers who are manuring with sulphate of potash. They have been manuring with stable manure, and with sawdust, which contains very little potash. They have discovered that by the use of potash the plant grows marvellously, and I believe that is where the trouble comes in. The same thing applies to anything we produce. The constituents must be there in the soil, and, if they are, then the resultant fruit will be right all round. With regard to citrus fruits, I am one of those who believe in going in for the very best varieties. We are confronted to-day with the question of export, and it is no use sending home fruit of an inferior quality when we have to compete against the world. I am pleased to be able to say that Mr. Benson has afforded the fruit-growers a good deal of information, and I, for one, was again very glad to hear his remarks to-night. I have been following his advice in the past, and have found that he is generally about right.

Mr. W. W. Burnett (Woombye): In order to get our custom, agents in the south will devise schemes which may result in temporary loss to themselves, and that may account for the Bowen fruit-growers getting complete returns from their Melbourne agents when the latter were just beginning to feel the competition of the Citrus-growers' Association. I believe in sending fruit right through by rail, and although some people may consider it an expensive

method of transport, I doubt very much whether it is really much more expensive than sea carriage. For the latter the fruit has to be carted from the railway station to the wharves, where it is, perhaps, cyanided. It is then slung from the wharf into the steamer's hold, the outer cases being squeezed in the sling, and the fruit in those cases damaged. In fact, it behoves us to try and get our fruit down to the southern markets as quickly as possible by rail. I lost 32 cases out of the last lot of 149 I sent down by steamer, and the damage they received in transit, and the loss of time were, I consider, the causes. Putting those 32 cases at even so low a value as 2s. 6d. each, it will be seen that I lost £4 over them, which would have more than recouped the extra cost of transit had I sent the consignment by rail.

Mr. F. W. Peek (Chamber of Agriculture): I have always been an ardent co-operator; have always advocated, and always believed in combination. But you must combine judiciously, and remember that the interest of one is the concern of all. With regard to the matter of a through train for fruit from Queensland to Melbourne, I may say that I have had the pleasure of meeting the secretary of the New South Wales Chamber of Agriculture, and discussing the subject with him. He has given me his assurance that he will use his utmost endeavours to get the growers of New South Wales to combine with Queensland and Victoria for the purpose of getting the through service. The matter of inspection fees is another that demands our attention, and I have heard from several consignors that, when their bananas and other fruits got to South Australia, these products were treated so harshly in the matter of inspection fees that the latter practically amounted to an import duty. Bananas, for instance, are charged 3d. per bunch, and the whole subject is one that deserves consideration at the hands of our Department. I therefore hope our Minister will try and see if he cannot get some reduction in these fees.

The Chairman: This matter of inspection charges has had the earnest attention of the Agricultural Department, but I regret to say our efforts have, so far, been without any apparent effect. When Mr. Scriven was in Adelaide recently, he made further inquiries, with the view of getting some mitigation of the charges. The only real way in which any redress can be obtained is by directing the attention of the Minister for Home Affairs to the fact that a breach of the Commonwealth Constitution is being committed. It is the old story of the early days of the United States, that of one State devising and imposing restrictions on all sorts of pretences upon the importation of goods and produce from other States, in order to secure protection for local industries. Of course, when the real object of these restrictions became apparent, it was soon recognised that they were opposed to the true spirit of the Constitution of the Union, and they were very quickly swept out of existence. I hope it will be the same in Australia, but we cannot expect all matters in the Commonwealth to run smoothly at once. For the present, it is undesirable that Queensland should set up anything in the way of friction with a sister State on such a small matter as this, for, as a matter of fact, the quantity of fruit that we send to South Australia is very small.

Mr. W. Deacon (Allora): The resolution that has been submitted affects matters of great importance to our district, for I understand that its recommendation embraces corn, chaff, and hay products. At present it is very difficult to send produce to Sydney. Oftentimes we have a surplus in our district, and the Brisbane market is glutted. Prices may be high in Sydney, with the result that there is a desire to send our stuff there. The charges on the Queensland railways are, however, excessive, and there are difficulties at Wallangarra. Moreover, unless they have been very recently altered, the charges on our railway from Warwick to the border are nearly as great as those from the border to Sydney. If we could only get a concession to the extent that Wallangarra should be regarded as a port, or on the way to a port, then it would be of great advantage to us on the Downs. I noticed lately

that, until the rains, there were large quantities of lucerne chaff going from Laidley to Sydney by rail.

The CHAIRMAN: That was because of the Sydney plague restrictions on fodder that had been in Brisbane.

Mr. DEACON: I had an interview with an official of the Railway Department, and told him that if we wanted to go to Sydney from Warwick we were charged as much as from Brisbane. He said, "We do not want you to go that way. Why don't you go down to Brisbane and go by boat?" That may be one way of looking at it, but we wish to get our stuff down there under the same advantages as we get it to Brisbane. I have great pleasure in supporting the resolution.

The CHAIRMAN: During the debate reference was made to the Fruit-growers' Conference held in Brisbane last year. When I came into the Department and began to look into the Acts that I was to administer, I found on the statute-book a very stringent measure dealing with diseases in plants. I consider, and that Act fortifies my opinion, that it is mistaken legislation to demand too stringent requirements from those you desire to comply with an Act. The Diseases in Plants Act is so absolutely stringent that it has been allowed to remain, so far as the fruit-growing industry is concerned, practically in abeyance. After conferring with those who were able to advise me, I summoned a conference of fruit-growers for the purpose of considering the Act. A number of gentlemen came together, and there was a great deal of discussion upon the points presented. Certain resolutions were arrived at which would have been put into effect, but—and judge of my surprise—the representatives, when they returned home, wrote back to me in numbers, and appealed, through their members, to recall the resolutions that had been arrived at. They went, they repented, they retracted. The result was that, while in conference, certain resolutions had been arrived at; yet, when they got to their homes and told the people whom they represented that it was proposed to proceed on certain lines, they wrote back to the Department saying, "Do not put into effect the resolutions we passed." I may say that, of all the men I have ever met with in the agricultural industry, I have never met so incohesive men as the fruit-growers. How it will be possible to weld into anything like one whole men holding such diverse views, I do not know. The Citrus-growers' Association have acted without any remuneration at all. All the Department has done for the association has been to give the directors free railway passes to enable them to come together periodically, for the purpose of conferring in the interests of the fruit industry. And yet, in different parts of the State, there are fruit-growers who speak slightingly of the work of the Citrus-growers' Association. The paper that was read by the representative of the Mooloolah Association contained a lot of pious platitudes. I believe, however, that that district was canvassed a few months ago with respect to the establishment of a fruit-preserving plant. A great deal of effort was exerted to get the fruit-growers to co-operate to utilise that plant so that the surplus fruits grown in the district might be preserved, and gluts in the local fruit market in some degree averted. While I have not the least interest, individually, in fruit-production, I offered to take fifty shares in the proposed undertaking, in order to help in pushing the thing along. The proposal was that, if the fruit-growers had not the cash, they could hand in fruit, and a portion of the proceeds from that fruit could be retained as payment towards the general fund. Everything was done to get the fruit-growers to come together, but the whole thing absolutely fell through. The proposals made at the Fruit-growers' Conference were such that, had they been given effect to, much benefit would have accrued to the fruit-raising industry. But, unfortunately, the man who has only an orchard of an acre is not dependent upon that orchard for his livelihood, and he unconcernedly propagates in that orchard pests that will destroy the produce of those who derive their living from the growing of fruit. The main objection was to the assessment, and, as a matter of fact, it was the idea of the assessment

that killed the whole business. I took good care, when bringing in the Dairy Bill, that I was not going to have a similar fiasco. I knew perfectly well in preparing that Dairy Bill that, if there had been no assessment to provide for the payment of the inspectors' work, and that if I had gone to the Treasurer and said, "I want to put on fifteen inspectors," his reply would have been, "Cannot you get the police to do the work?" The result would have been that we would have had an Act from which nothing would have come, simply because we would have had nothing from which to provide the sinews of war. I do not see why the same thing could not have happened with respect to the fruit industry, but some growers pulled one way and others another way, and we still have on the statute-book an Act which is largely inoperative so far as the fruit-grower is concerned. One gentleman mentioned that the time of the delegates to that fruit conference had been wasted. I may say that my time was certainly wasted. I will not ask the State to give more to the industry than is now being contributed. There is more money being spent, comparatively, by the State to develop the fruit industry than any other industry. If it is desired to have further inspection, then the only way in which it can come is by some fair system of assessment whereby those who will benefit will contribute towards the cost of inspection. If I pay £1 for a pair of boots, I reckon I get value for my £1, and the man who is assessed in respect of his orchard will get his assessment back in various ways. One of the proposals at the Conference was that there should be district boards, which should levy their own fees; but the Conference said, "Do not do that; have a general scheme throughout the State." The result was that we fell between two stools. In the North Coast and Stanthorpe districts we have two portions of the State which are fairly clean from pests. As far as the intervening portions of the State are concerned, I do not know whether it is worth while trying to save them or not. If the other two districts, however, are prepared for fees or assessment, and talk in a rational way, then they can depend upon it that the Department will respond to their requests. Upon the Blackall Range there are a number who are doing good work; they are talking about their citrus fruits, and suggest the establishment of a curing-house, which it appears can be erected for a reasonable sum of money. I can now tell them that they can come to us, and we will see if we cannot give them half the cost of erecting the house and providing the necessary machinery as a loan from the vote in aid of co-operative agricultural production. If they find the house is going to cost £500, they will have to find £250. Then, if the security and other conditions are satisfactory, we may be able to advance them the other £250. Anything that can be done in reason to assist the fruit men will be done. But, unless they know their own minds, and unless they are prepared to contribute towards the cost of a further number of inspectors, I cannot see what more the State can do for them. What have we been doing in the North with the banana men? Of our exports of fruit, bananas are worth the greater proportion of all the rest put together. The big banana industry was threatened with extinction because, in the south, they said, "You are sending us bananas from Queensland affected with fruit fly," and there was danger of New South Wales and Victoria being closed altogether to our bananas, just the same as Victoria has closed her ports to our mangoes. We said to the Chinese growers, "We must have at least five inspectors, and you will have to find the fees to pay those inspectors." The Chinese recognised that if the inspectors were not appointed they would not be able to ship their fruit. Consequently, they agreed, without demur, to pay 1s. on every hundred bunches of bananas exported. On bananas sent to Brisbane they do not pay. We have arranged with the shipping companies to collect the fees, and remit them to us without any deduction whatever. The Chinese at once realised the position, and the result is, we have now five inspectors at Geraldton and Cairns dealing with the export of bananas. Thanks to the careful inspection that the fruit receives, very little difficulty now arises down south with respect to our bananas. If we had been dealing with Britishers at Geraldton and Cairns, we never would have got the inspection. The growers would have fought against the fees, and

said it was taxation. As far as the banana trade is now concerned, our trouble is with the shipping companies. Instead of two boats leaving Brisbane for the North every Tuesday, only one boat leaves. Consequently, the boats from the North are over-filled with fruit, and trouble results. The companies admit the trade is a big thing for them, and while they are not prepared at present to put on a second boat, they are making inquiries of the shipping companies at home with the object of ascertaining how the bananas are shipped from Jamaica. They tried to say, when the last big shipment of bananas to the south was found to be bad on arrival at Melbourne, that the fruit fly was the cause. But, happily, the Under Secretary, Mr. Scriven, was in Sydney at the time. I wired to him to go to Melbourne. He went forward by the train leaving the same night, and he proved beyond all manner of doubt that fruit fly had nothing whatever to do with the destruction of the bananas, which, as a matter of fact, had been destroyed by over-heating, caused by the steamer having been over-loaded. As said before, if the fruit men will only let us know with one voice what they want, then we will be able to do something for them. If it is so difficult to get them to come to some common basis as to what legislation can be enacted for their benefit, I do not know how they are going to combine for the selling of their fruit. I have spoken to many who have come to me on the fruit question, especially concerning the Sydney market. I believe, if the growers had a man down there directing operations, it would pay them all round. Mr. Knowles told me he asked a retail fruiterer in King street, Sydney, "Why not sell your strawberries at a lower price?" "How can I," retorted the man, "when I have to pay £25 a week rent for this shop?" Such charges, of course, keep the price of fruit up to the consumer, but our growers, if they combined, ought to be able to get a section in the Belmore Markets for a small sum, and place the fruit within the reach of the consumers in the suburbs at a price much nearer what the producer gets for the fruit than the consumer has now to pay. The consumption would go up enormously, and that increased consumption would beneficially react on the industry. The Citrus-growers' Association is entitled to some credit for what they have so far done to bring about co-operation among the fruit-growers, and I trust they will not relax their efforts. As for the "Hector" shipment incident, what Mr. McKay has said is about right. The association asked the Government to buy the vacant cold storage space in the "Hector" which they had contracted for, but which they were unable to fill with cases of oranges. Failing that, they asked us to advance the money to pay the freight on that space. My reply was, "Have you seen this letter of McKay's? My advice to you is to take the fruit as far as Melbourne, and sell it there to the best advantage. Your first loss will be the least loss. As for the State buying the space, in the face of Mr. McKay's report, that is ridiculous." After all, as Mr. McKay has pointed out, the shipment was not altogether a failure, because the association has learned some wrinkles from the experiment which should be of service to them in any future shipments they may propose. I think it is always best to speak plainly, and I have done so now, for I have always found it exceedingly difficult to do anything to assist the fruit man, as much as I would like to assist him. Mr. Benson has been preaching one story evidently, for he has used as the basis of his paper to-day a paper that he read some years ago in New South Wales. Yet he has failed to make an impression. If you can get together among yourselves, and the delegates are empowered to act, and ask me to summon another Conference for the purpose of amending the Act, then I will do so. But do not let men go round complaining that there is going to be additional taxation. Nothing of the sort is intended. If assessment is levied, it will be paid for services rendered. With respect to the motion, if it is carried, it will be my pleasure to press it. In fact, I hope to press the matter still further. A good deal of wheat has been going south from the Downs, not only on account of the plague restrictions, but because it is as cheap as sending *viâ* Brisbane. Speaking of maize, the freight from Warwick to the border is not nearly equal to what it is between the border and Sydney.

The resolution was then carried unanimously.

SIXTH MEETING.

Wednesday, 17th May, 1905, at 9.55 a.m.

The first business was the delivery of the following address by Mr. R. S. Aiken, of the Council of Agriculture, Bundaberg, on—

THE POSITION OF THE PRIMARY PRODUCER.

[By R. S. Aiken, North Kolan.]

In writing this paper I wish it to be clearly understood that I do not intend to enter into a controversy between capital and labour, as I recognise that this is neither the time nor place. My chief concern is the position of the primary producer, and I shall therefore proceed to define the everyday practical meaning of the terms "Capital" and "Labour." By a capitalist we mean an individual who, having money of his own, or at his command, is willing to invest it upon being satisfied that he will receive an adequate return. By the term "Labourer," we mean an individual who offers his services, be it hands or brains, or both, for a monetary consideration. It will thus be seen that a capitalist and a labourer are closely allied to each other, inasmuch as they both offer their services to somebody with precisely the same object, and without that somebody they are both useless. To explain my meaning, I will illustrate it thus:—One side of a street is lined with capitalists, and although they may be possessed of an unlimited number of sovereigns, yet these sovereigns, of themselves, cannot increase in number or value. On the other side of the street are thousands of labourers. Now, these individuals are in the same predicament, as, without the aid of a medium, they would be nothing more or less than a mass of unemployed. This medium is the much-despised primary producer, through whose agency these two factors, "Capital" and "Labour," are brought into active operation. The most extraordinary thing to my mind is, that all the wrangling and fuss are being made by these two classes, while the primary producer, who maintains them both, is quietly ignored; for not only does he maintain them, but he is the axis upon which the whole community revolves. This was clearly demonstrated during the late disastrous drought, as during that trying time, the capitalists and labourers were with us just the same, and if they are of such importance that the tumult they create would make us believe, why all the depression and stagnation in trade? Simply this (notwithstanding their bombastic display), owing to adverse climatic conditions, the primary producers were unable to obtain from the soil that which both the capitalist and the labourer required to enable them to exist. Now, what is the relative position of the primary producers, and the strife between capital and labour? I shall make this point clear by a simple illustration. A farmer has two men in his employ; these two men represent capital and labour. By and by they engage in a heated controversy as to the number of hours they will work, the conditions of same, and the rate of pay, while the farmer stands quietly by, evidently satisfied with the consolation that it is his privilege to find the wherewithal to maintain the fight. Now, gentlemen, is this not the actual position of affairs in Queensland to-day? Could anything be more humiliating in any other walk in life, to find the head of the firm dictated to and told by his employees how he, the master, shall carry on his business? Then, why do we, as primary producers, allow others to dictate to us? Our land laws, our shipping, carriage of mails, railway freights, class of emigrants, in fact, every single item that affects our welfare, emanate from those whom we employ, and whose very existence depends on our energy. All these laws are framed solely in the interests of the wage-earners to the detriment of the primary producer. For this wretched position we have nobody to blame but ourselves, as, owing to the want of a thoroughly-equipped organisation, we are at the tender mercies of both capitalists and labourers, who, to satisfy their own aggrandisement, are willing to sacrifice their time and money on our behalf (so they say). We often hear a farmer say that, owing to pressure of work, he has not time to attend a meeting. Just here, to such a one, let me say this: In the near future, if he has not the time to attend a meeting of brother farmers, he will (owing to the action of others) have no farm to attend to. New Zealand is often quoted as a desirable place to live in. Knowing a little about it, I echo the sentiment. But there is one thing the farmers in New Zealand have that we in Queensland have not—that is, a union, with branches which extend from the Hauraki Gulf in the north to the Bluff in the south, and, although only brought into active operation some two or three years ago, is now so strong that even the Hon. R. J. Seddon has

been made to feel its existence. As a further proof of the absolute necessity for a union of primary producers, note the number of insignificant conferences which have been held in reference to the continuation of the sugar bonus. Not two of these conferences have agreed, but each has sent along its grievance, which the Federal Cabinet has taken as much notice of as they would of a Chinese cracker. Methinks it would have been different had there been a farmers' union throughout the Commonwealth. Further, even the results of this Conference, although they may be much, would be greater if backed up by the solid force of a union. Now, we primary producers of Queensland will continue to be at the beck and call of any agitator who may come along, until we have a union consisting of 50,000 or 60,000 members, and the sooner the matter is taken in hand, so soon will the relative position of the primary producer in the strife between capital and labour take its rightful position—not necessarily a position of dictator, but will most assuredly act on any capitalistic monopoly on the one hand, and also act as a guard to prevent any extreme scheme of labour being brought into existence. This will tend to bring about contentment between the two classes who are contending so bitterly against each other, and in that contentment bring prosperity to the State of Queensland, which for the time being we have made our home.

The next paper was by Mr. F. W. Peek, of the Chamber of Agriculture, Brisbane, and was on—

AGRICULTURAL ORGANISATION: WHAT QUEENSLAND NEEDS TO-DAY.

[By F. W. Peek, Secretary, Queensland Chamber of Agriculture.]

This is the terse subject chosen by the Chamber of Agriculture for me to speak upon at this Conference; but, firstly, it is my pleasant duty, on behalf of the Chamber, to congratulate the Minister for Agriculture for calling together the representatives of the various societies of this State to rub shoulders and give their views upon the many various subjects that have been thought to be of interest to the societies and districts represented.

The subject I have been requested to take up is a large and a broad one, and affects not only those members present, but I trust will prove of sufficient importance and consideration to the agriculturists of this State generally to arouse in them a determination to assist, by every legitimate means, the efforts of those who are endeavouring to benefit the "man on the land," by educating him into better systems of production and disseminating the latest information as to what is required to enable him to take his place in the markets of the world, and by practical schemes of co-operation to combat the many varied troubles he has had to contend with hitherto.

Our Organisations of To-day.

In looking up the last issue of the *Queensland Agricultural Journal,* I find that there are not less than 183 societies enrolled, each one established with a view of assisting to improve or help its members by meeting together, exchanging views, ventilating their little grievances, and, by socially talking matters over, creating a more friendly feeling. Especially good work has been done in the past by holding reunions, annual shows, &c., &c. But I am sorry to say the facilities offered to farmers and others to combine have not been so widely taken advantage of as they should have been. It is to meet this apathy on the part of our farmers that this question of organisation has been chosen, and in travelling through this State I find there is a growing feeling that a better system is desired than now obtains—something of an organised system that will leave a society to follow its individual requirements, but at the same time leaving it part of an institution whose machinery and system, emanating from a department with a sympathetic Minister at its head, are created solely for the purpose of assisting the various organised bodies and the agriculturists of the State to help themselves upon safe lines of sound development. "Union is strength," and this appeals to our farmers and producers to-day with more force than ever before in our State history. The drastic legislation foreshadowed by the Federal and State Governments require the keenest thought and intelligence to modify and advise upon as wisely as possible. I speak strongly, but consider what the handful of people in this State have worked so hard to attain! All honour to the men who have borne the heat and burden of the day, and who have been the pioneers of such industries as we now possess; who have expended time, brain, and muscle, fought floods, droughts, and fires, to attain to their present position—whose sole aim has been to make

Queensland a nation; and I call upon every individual farmer and producer to assist by co-operating, from north to south and east to west, in a common brotherhood, whose motto shall be: "The trouble of one is the concern of all." In speaking upon our present organisations and their methods, I find that, whilst a number of societies are laudably engaged in working up an annual show and doing nothing more, there are others which are rapidly increasing, and are known as "Farmers' Progress Associations"—clubs, &c. These societies generally take up the questions of marketing, road-forming, opening (in their respective districts), railway communication, irrigation, &c.—some such societies even going so far as to start the erection of creameries and purchasing of seeds, store goods, fertilisers, and machinery; and in most cases these small societies, without State monetary assistance or subsidy, are doing splendid work co-operatively, and I look upon these societies as the pioneers of a new system that is gradually being brought into existence—namely, that of "self help." And it is more particularly to such small societies that affiliation with a central body is of great value, being as they might be represented thereon by a delegate, who can attend their meetings, and so bring forward their wants and requirements, which, being supported by the larger representative body, are thus advanced with more power, and the smaller society gets more consideration than could be possibly attained by an individual or a small section of the community. Especially would this apply to railway matters, shipping, freights, or markets—subjects which are of far-reaching benefit to the agriculturist generally.

At the Bundaberg Conference, held in 1901, some such scheme was brought forward and endorsed by those present, the result being the initiation of the institution I have the honour to represent to-day, known as the "Queensland Chamber of Agriculture," the council of which is formed by gentlemen elected by the various members and societies affiliated therewith—men who have the keenest interest of the farmer at heart, and who gratuitously devote a large amount of time for the benefit of all concerned. Several matters of vital interest to our varied industries have been taken up by the chamber and brought to a satisfactory issue. But even here there is a complaint that sufficient support is not being given. Whether it be for the want of a more complete scheme or that the payments are too high are questions now being considered by that body, and a system that will appeal to all is being discussed by the chamber, which it is hoped will be both useful and popular. Certainly it is in the interest of all societies to affiliate and induce as many members as possible to join. I know the difficulties that beset those who are doing their best in the interest of their fellow-workers. Farmers are the same everywhere—slow to take up new ideas, and very suspicious of the motives of those who promulgate them. However, this difficulty can be overcome by those who are determined to overcome them, especially when farmers are made to understand how it affects their pockets. It has been stated by the late Lord Salisbury "that he had always found that the best way to get a farmer's sympathies was to tell him he was on the verge of ruin, and the worst way of recommending himself to them was by telling them they were in a flourishing condition." The chief difficulty in organising agriculturists is to get prominent men to support and give themselves to the work, especially in country districts. The young people of Australia have minds of their own. They are full of confidence, energy, and ambition; they are not content to follow the old "jig-jog" of their ancestors, nor to accept without question the lines laid down for them. In some cases this may be self-conceit instead of self-confidence; they may be headstrong instead of self-reliant, but that is all the more reason for taking them in hand by getting them to attend meetings where wiser and older heads are to be found, and where every facility is placed at their disposal to inquire and learn for themselves the various problems that the successful farmer has had to overcome.

State Assistance.

In the matter of forming and assisting in organising societies, very little practical assistance has been rendered by the State. Certainly the experts of the Department in going round the various districts have given lectures, demonstrations, and advice, and in some instances small meetings have been held afterward, which have developed into an association or society; but nothing further has been done by the embryo society to enlarge its operations or affiliate with other societies. State assistance has certainly been given to societies holding annual shows by a subsidy, and also by money grants and special prizes, with the object of stimulating production in certain lines, but of late years the amount of subsidy has been reduced. To some extent I agree with the withdrawal of subsidies for show purposes, because, in the first place, the development of the agricultural

industries of this State is now taking a broader basis than formerly, we having now reached the limits of home consumption in some productions; secondly, the amount of money required by the Department in enlarging its former operations will have to be largely increased, and it will require all its available means to bring about good results; so that if the subsidy to societies were to be continued as formerly either specific industries that need assistance in development and finding markets would have to be taxed to meet such requirements, or they would have to be left to those specifically interested to work out co-operatively with no outside assistance. This might seriously retard their development. Where the State's assistance could best be given to-day would be, first, the furnishing of reliable statistics as to the amount of crops, the demand for such crops, and the market for the produce when gathered. I refer to the fruit, wheat, barley, and maize crops. Fruit deteriorates or is often left to rot, and I have known farmers keep their crops back through being misled as to the amount required for local consumption, or as to where it could be placed to advantage at the right time; and in some cases great pecuniary losses have occurred to the grower. State assistance could be rendered at local shows by a travelling exhibit of the latest and best productions of machinery or appliances, models of inventions for labour-saving, statistical information, lands available for occupation, samples of soils, fertilisers, &c., together with practical information of all kinds pertaining to the agricultural industry. I feel sure this would prove most attractive at country shows, and be an educational factor of great value. I would like to say a word here about the *Agricultural Journal*. As an organ that was started by the Department, it has done good work in disseminating information. There are hundreds of farmers who would never have had such matters brought before their notice if such information had not been so collated and published, and I am sorry that on the grounds of economy the usefulness of the *Journal* has had to be curtailed—when, in fact, it is just now that there is more urgent need for its publication than ever. I would have desired to have seen its enlargement, and was looking forward to its being the means of reporting the monthly meetings of our societies, together with what business had been done. Questions could have been asked through its pages, and all possessing the knowledge could have answered to the best of their ability. It might not be expert advice, but it would certainly have been practical experience (which is of far more value to our struggling brother in the back-blocks). I trust that the Minister may be enabled on behalf of the farmers of this State to obtain sufficient money to enable the *Journal* to be again sent out as formerly.

REORGANISATION NEEDED.

In view of the important papers that have been read and printed at this and previous conferences, and with a view of consolidating our societies into concrete form for their better working, I beg to submit the following scheme of reorganisation for your consideration:—

First. *Basis*.—In the first place, agricultural societies should be governed by Act of Parliament, and established on one basis, with their varied objects left to themselves, but all working under the same rules, as in the case of local authorities. This would give uniformity of working by systematic rules and union of interests. The law should enact what shall constitute an agricultural district entitled to be recognised as such (by the Department of Agriculture and Stock), and a charter issued for such district. A basis of qualification to be drawn up with the proper classification, and arrangements of districts wherein such societies' charters would operate, the Department of Agriculture and Stock to issue such rules and regulations, instructions, &c., as to management and duties. Each district should then have a council or central board representative of such district, consisting of nine or twelve members, such board to be elected by the farmers for three years—three or four members retiring annually, or being re-elected, as the case may be. The members of the central board or council to be balloted for by the members of each group of societies formed in each district. The law should provide for the proper method of election of president, treasurer, and secretary, thus creating by enactment one basis of uniformity working under the same law, the membership of one society being transferable to any other. The district central council or board thus established would be represented on the Chamber of Agriculture, which body would act directly in conjunction with the Department of Agriculture and Stock as a board of advice for the respective districts, and be the means by which information would be given on all agricultural matters, such as areas under cultivation, statistics, future prospects of crops, diseases in plants, pests, &c. The present system of annual shows is of very great value as a local

educational factor, but I favour the establishment of one State show or exhibition held annually, recognised and accepted as such, there being provision made in its constitution of the management for a representative from each district council to have a seat upon the board of management. It should be the duty of each district representative to collect and work for the success of the annual State show to better illustrate the combined producing capabilities of the State. All games of chance and other matters that savour of gambling, side-shows of an objectionable nature, should be eliminated from the showgrounds by Act of Parliament.

Second. *State Assistance.*—The question of subsidy has been a sore point with many societies. In some cases a subsidy has been paid to a wealthy society, whilst smaller and struggling societies in the same district doing good work could not obtain monetary assistance where it was greatly needed. I would, therefore, as stated before, suggest the withdrawal of the system entirely, and substitute (should funds be available) a system of bonus on the amount expended or work undertaken of a nature beneficial to each district concerned. This would include destruction of noxious weeds, insect pests, flying foxes, &c.; also assistance in the purchase of seeds, outfits, or implements for the use co-operatively of each district, the amount of grant being governed or determined by the work done of a practical nature, or by good results. Prizes and certificates should be awarded at shows by the Department of Agriculture and Stock, which would be of far greater value to competitors than those obtained from the local society. All showgrounds, reserves for water and stock, market reserves, &c., should be vested in the Minister and the Department of Agriculture and Stock, who could place them in the joint guardianship of the district agricultural board or council and the municipal or other local governing body. All rents, charges, or incomes, after paying working expenses, to be paid into the Department of Agriculture and Stock, such moneys to be used for redistribution as bonuses, &c.

Third. *Agricultural Education and the Dissemination of Knowledge.*—Having written largely upon this phase of agricultural interest, I need not repeat myself here; but having lately received from Canada, America, and other parts of the world valuable information as to what is going forward in the matter of agricultural education in those countries, I can emphasise more forcibly than ever the stern necessity for our societies taking up this work as part of their duties. It should be recognised that it is the province of agricultural societies to continue to impart knowledge and education throughout the year, and by enactment it should be made imperative to hold meetings at least once a month, and these meetings should be all open meetings, and not merely confined to the board or members of committee, but to all members of the society. Papers should be read and discussed, and to facilitate such objects a synopsis of questions drafted by the Department or central chambers of agriculture could be put through the medium of the *Agricultural Journal* upon matters of vital importance, or upon any matters requiring legislative action. This would arouse a keen interest in matters of passing moment, the replies being condensed and published in the *Agricultural Journal* monthly for general information; and I feel sure that much sound, practical knowledge would result from these sources. The exchange of thought and ideas would create a little friendly rivalry between associations, and tend to cement in a closer bond of union the agricultural community, and profitable development would be the result. Our societies must assume the character of agricultural schools. Visits could be arranged to well-managed dairy farms, experimental farms, nurseries, and agricultural colleges. Organisers might be appointed to visit the smaller districts, forming branches of the district society, giving advice, explaining methods, exhibiting methods of cultivation, drainage, irrigation, &c., by means of diagrams or lantern slides—not in the stiff character of an expert schoolmaster, but in a social and friendly spirit, to let the man on the land know that the Department has other aims besides taxation—that its chief aim and object is to assist the farmer by helping him to help himself; and this can only be done by the assistance of all who have the welfare of this State at heart. The man who cannot spare a little time to attend meetings where knowledge is to be obtained is not true to himself, his family, or the State. Agriculture to-day demands a keener knowledge, greater interest, together with every possible information as to markets and the preparation of our products. Keeping in view that "an article well shopped is half sold," this can only be brought about by educating our producers up to the standard of the world's markets; and this can be safely left in the hands of the Department, ably supported by the various organisations working and co-operating to the one great end of placing our State's products to the front for both quality and excellence.

In conclusion, I would ask you to well consider what I have stated. Now is the time for action. Older States and countries are making a bid for the world's markets. You want those markets now in various lines, or a fair share of the trade; and though a severe obstacle has been placed in our way in the matter of rapid transit, I feel sure that by amalgamating our forces, unifying our interests, on the lines suggested, focusing the needs and requirements of each district, and placing them through the central council in such a manner that administration with respect to the wants of our industries will be more satisfactory and less problematical in results, with which suggestions I trust to have your full sympathy and earnest consideration.

Mr. Peek's paper was succeeded by—

THE AGRICULTURIST AND HIS GOVERNMENT.

[By C. F. M. Fischer.]

Agriculture is the most ancient of all cults on this earth. The great grandfather of our race commenced operations in a garden. He was more fortunate than most farmers of the present day, as he found one ready made to his hand. Unfortunately for him and for us, he did not realise how well he was off till he was evicted for misconduct. No doubt he found it hard lines earning his bread in the sweat of his face, battling with thorns and thistles (representative of all the pests the agriculturist has to contend with). It is not much wonder that many of his descendants tried to forsake his cult for something easier; so one became a squatter, and he has a numerous following, especially in this country. It is a most remarkable thing that an occupation not only the most ancient, but also the most important, should in course of time have come to be regarded as so low and degrading that it became an occupation for slaves only in some places. And whilst it takes no sage to see that even kings are nourished from the fruits of the fields in common with the beggars, it seems hard, even in this enlightened age, to make many intelligent people see that agriculture is a very honourable calling, and that intelligence need not go to waste on a farm. Time was when, in one of the most enlightened countries, tilling the soil was looked upon as so degrading that slaves only were used; and I should not be surprised if the employment of kanakas and other coloured men is not in some measure due to such false ideas. It is not yet entirely a thing of the past to regard the field and garden as the place for the dull boy who fails at a trade or profession. It is certainly a compliment to generous mother earth that she should be looked upon as fit to support those who fail at other occupations. If, under such conditions of working, agriculturists managed to produce sufficient to sustain all from beggar to monarch, we need not look gloomily into the future now that agriculture is receiving from the powers that be a little attention which for ages past has so unjustly been withheld. There are many reasons that account for this lack of recognition in the past. The general lack of education is one. The long hours farmers find it imperative to work are another. The want of leisure to intellectually improve their already neglected education accentuated this and does so still, for, whilst an eight hour day was deemed a necessity for almost all occupations, the agriculturist, like the domestice servant, must not be limited. It is a well-known fact that, even in thickly settled agricultural districts, schoolmasters find it almost impossible to retain scholars long enough to form a sixth class. After they reach twelve years of age they gradually drop out, especially the boys. The earth claims their attention, and necessity in most cases compels them to give it. My memory of things in Germany is very limited, but I well remember my father telling me that the comparative failure of the revolution in Germany in 1848 was laid to the charge of agriculturists. They had not been educated up to the need of political reform; and how could they have been? Most of them were lamentably illiterate, and the land-owning nobility took good care to keep their noses to the grindstone for twelve and more hours a day. Sunday was their day of liberty; they were at liberty to till their little garden plots when the master did not need them for urgent work at the harvest. We are often charged with being the slowest of all classes to appreciate the value of concerted action, even where our own interests are concerned; and how could it be otherwise? The causes just mentioned, accentuated in this country by our comparative isolation from each other, largely explain the reasons why. We are not Chinamen, and cannot be expected to meekly do as we are told; but our evolution has not reached a sufficiently high plane to lift us out of the haze and maze of individualism, and enable us to appreciate fully the benefits of collectivism. But we are rising slowly but surely.

It may be that the mills of the agriculturist are working after the Divine pattern, as expressed by the German poet, "The mills of God grind slowly, but they grind exceeding fine."

It was many years after a late Minister for Lands told me that agriculturists were the backbone of a country—that it was thought it might be advantageous to establish a Department of Agriculture; and eventually agriculturists had the satisfaction of seeing their important craft recognised politically by the establishment of a Department of Agriculture, and, although the first head of it was a lawyer, good work was done. I well remember our present Minister for Agriculture and myself climbing into a railway truck at Rosewood one Good Friday to examine the paraphernalia of the travelling dairy. That was years before he thought of becoming Minister for Agriculture or even a member of Parliament. I always look upon that travelling dairy as the inception of the now rapidly increasing dairying industry. It was the first public demonstration of its kind by the Government in my recollection, showing that they really meant to help the farmers' sons and daughters by aiding them educationally. It was natural that the establishment of an Agricultural College and experimental farms should follow, and that instructors and experts should be engaged. Many a time have I defended the Government of the day from the fierce accusations hurled against them by many farmers for wasting the money of the country on highly salaried experts. My contention is that Governments in general have for so many ages neglected to seriously concern themselves with the affairs of agriculturists that time must be allowed them to feel and find the right way to help them. As for the waste of money, enough has been wasted on less important matters, so that we need not grudge the little that may run to waste when our Government is trying to really help us. And what should the relation of the Government be to the agriculturist? I say it should be fatherly. It should settle suitable people on the land, and should provide suitable land for them. And is it proper that the Government should do more for the agriculturist than find him suitable land? Yes; much more. Although the time is not ripe for our Government to control the production and distribution of the agriculturist's wealth, it is quite ripe enough to make tentative efforts. It is not enough that our Government should encourage us to produce good things; it is needful to help us to find markets for it. Where would the dairying industry be if profitable oversea markets had not been found for butter? We have several examples of the assistance afforded in a small way by the present Government. Mr. Fern, the poultry expert, lectured here, and the greatest crowd any Government expert ever got together at Zillmere was the one that came to hear Mr. Fern and see his pictures. He gave poultry-raising an impetus. Our Government did a fatherly thing in initiating and superintending a trial shipment of poultry to England, which, as I saw from the cable, had arrived in good condition. Mr. Benson has encouraged the fruit industry, and a large area has been put under pines during the last few years. What the Minister proposes to do for the cotton-growers and others shows us that the Queensland agriculturist can at last look to his Government and know that such help as at present can be rendered will be rendered. But is it right that the Government should do these things? Yes, and many more, and to a greater extent, because the agriculturist in this country is in a particularly helpless condition—partly, as already stated, on account of his comparative isolation and distance from commercial centres. Few produce on a large scale, and exportation by them to outside markets is, therefore, out of the question. Farmers may have the ability to produce the very best of products, but few are able or willing co-operatively to find outside markets for any surplus, and therefore must entrust themselves to the tender mercies of the middle-man, and that may be one reason that, even after years of plenty, the average farmer is as badly off as before. Just an example from my own experience: Before the great drought I used to raise a considerable quantity of honey, even before honey was at bedrock prices, for I refused 3d. per lb. in Brisbane. We read a lot about the price of honey on the London market, so I decided to be my own exporter. I consulted Mr. Denham, and we both sent honey to the London market. His was the best of honey, and candied, in new tins and new cases; so was mine, but it was liquid. Our returns had a laughable as well as sobering effect. We sent to different firms, both honest. He got 18s. per cwt., I got 19s., and we expected 45s. Mr. Denham's agents said his honey was adulterated with sugar. My agent said my honey was liquid and evidently largely mixed with glucose, an article I have not seen to this day. I have not touched the London market since. Now, what I contend for is a little and ever-growing socialism in our time. Do not let us stop at an Agricultural Bank nor its present scope, but let us go on to perfection. The Government could

treat all exportable products as they did in the case of the poultry shipment, the Cape gooseberry and pine pulp, the cotton, &c. Small and large quantities could be received in Government stores, and suitable markets found for the various products. Even if we did not grow rich all at once, we would have the assurance that even in foreign markets no one could play tricks with the agriculturist, because of the protection afforded by his Government.

Dr. T. F. MACDONALD (Geraldton): I must confess I regret that the five-minute limit placed upon speakers will be of service to you this morning, for in the three papers which have been read I could find material to address you for six or eight hours. These papers have certainly given me very great pleasure, but it is because I have so much to say on them that I am afraid I shall hardly be able to say anything. Mr. Fischer tells us that our father Adam delved in the Garden of Eden, but he forgot to mention that his wife Eve was with him. It struck me that perhaps the forbidden fruit which Eve ate was a pineapple. As one interested in the subject of socialism, I followed with much interest the trend of thought of the writers of the three addresses, and am inclined to be of the opinion that Mr. Fischer, in his tendency towards partial socialism, is moving in the right direction. With regard to Mr. Peek's paper, I would like to say that it is a very able paper, and, because it is so, I intend to deal with the points upon which I agree with him, and also with those points upon which I differ. The grand scheme of a producers' society is a good one, for such a society would be one of the most powerful agencies for the evolution of this country. The movements and combinations which are going on just now are brought about by the tremendous success which political combinations have been having in the last ten or twelve years. I believe, as a matter of fact, that an organic association is being forced upon the producers and upon the consumers of the country by the success of the political propaganda which has been forced upon them. The political organisations have been so perfect that they have very nearly got possession of the political machine. They are bringing into existence laws which we may or may not agree with, but laws which we will have to obey or appeal against by a bloody revolution. If the workers get complete possession of the political machine, they will bring into existence laws which the land and property owners will have to fight against. How are you going to bring about this political organisation amongst yourselves? I do not care whether it is Labour or any other party. You can only meet such an organisation—which is a terrible and powerful thing—which will create laws which you will have to obey—by similar combination in agricultural and industrial matters. You are only moving now, simply because you are compelled to do so. I prophesied this ten years ago, and said the time would come when the country would become inimical to its individualism, and would be forced into combination by sheer necessity. Now, although late in the day, accept it, and give it your full attention, because you are touching upon natural laws, which will bring about a complete evolution of your society. If people combine, they must combine upon ideas upon which they agree. It is no use trying to force a man to combine with you, for he will not combine unless he agrees with you. You must combine upon a voluntary basis. You create your organisations, and you agree to them because you see that they are for your good or advantage. Such being the case, it naturally follows that you have to look into the future as to where your organisations may evolve you. You have got your organisations according to Mr. Peek's shadow, and it is a very able platform to begin on. But it comes down to one point. Mr. Peek has got his organisation throughout the country, and the next thing he intends to do is to hand it over to the Government. We have got our Central Mill Association at Geraldton, and our object in organising is to get that mill. We intend to make use of the forces we find in the country. The Queensland Parliament has got the money. The Federal Parliament has got the restrictions, and it is the duty of our association to try and remove the restrictions and induce the Queensland Government to give us money for the mill. If our association were handed over to Government supervision, I wonder

where the strength of the association would be. It would be purely a part of a Government department. Mr. Peek makes his industrial organisation, and then calls in Government supervision. The moment that is done, the organisations would lose their sting, and they would no longer be your own associations. If you want to keep your strength, keep the regulation of your societies among yourselves. To some of you I may have been represented as a sociologist, and I may say that I have in hand at the present moment the constitution of industrial international organisation. In time we will meet on parallel lines to discuss ways and means. This is the movement of the coming age—the organisation of the producers. They have been too long in thinking for themselves, but it is by experience that we learn. You have learned from political organisation how strong organisation can be, and you have yet to learn how strong industrial organisation can be. But be ever careful how you let the power of that organisation get out of your own control.

Mr. A. Rickert (Allora) said there was scarcely anything for him to say after the remarks that had fallen from the lips of Dr. Macdonald. He would say, however, that organisation was the most important question before the Conference, and before the producers of the State. Organisation meant what was being brought about at that Conference, and the Minister was to be congratulated for bringing about the means of representatives from the whole State having an opportunity of exchanging views, even if it were only on that very question. Organisation of the different farmers should be brought about for their mutual benefit, so that they might not pull one against another. At present they were not in a position to ask what they needed, because one portion of the State wanted a certain thing, and another portion something else. When they were united, and had a central place of meeting agreed upon to meet there occasionally for the purpose of discussing their needs, they would be able to decide what to do, and take united action for the presentation of their wishes to the Government. Of course, what they wanted, and what they needed, were very different things. If they took united action to tell the Government what they did need, and the Government had anything to give, then they would get their share. But as it was at present, the producers of Queensland were at cross purposes, and the consequence was that the wagon of progress was sticking in the mire and would not move.

Mr. B. T. McKay (Maryborough): I was very pleased to listen to the even, calm, temperature views expressed by Mr. Aiken in his paper, and without saying much about organisation, it seems to me that he has struck the right note. It is just a quiet combination of all the farmers in the country. You have your political organisations, but how little do you hear about the farmer—even in the House. Of course, we have our Minister, who is an enthusiast, but how few there are in the House who are prepared to support the farmer. If you will read carefully Mr. Aiken's paper, you will find some useful ideas, which only want carrying out to be powers in the land. While admitting that annual shows are of great advantage, still I must say that they have many abuses, and one of the most serious is that the competition at them is not true. I do not think any man has a right to put in an exhibit unless it is his own. I do not think that my district has a right to put in an exhibit unless it is all that district's own, and it should be an important duty of the judge to ascertain where the different portions of the exhibits came from. I could tell you scores of cases where commodities which had no business there were included in district exhibits, but I will not mention names. But I was asked once to contribute a collection of fruit to a district exhibit, which I did. I also sent an exhibit to the same show on my own account, and afterwards found that the fruit I had sent for the district exhibit was used in competition against my own fruit in the ordinary classes. I have heard of wool being sent to some of the district exhibits, although wool was not grown in the district. It is so all round, and I would impress upon the National Association, and the Government, too, the necessity of doing everything they can to make our exhibitions purer, truer, and consequently better exhibitions.

Mr. T. E. Coulson (Rosewood): I would like to offer a few remarks in connection with the papers that have just been read. So far as Mr. Peek's paper is concerned, it is a very able one. I look upon Mr. Peek as a great organising factor, and, in fact, I call him a born organiser. The whole tenor of this Conference seems to be organisation, and probably that is as it should be, for we all recognise that every producing industry ought to be organised for the protection and advancement of its interests. There is one matter in Mr. Peek's paper that I wanted to speak about, and that is his proposal that the Government should withdraw the subsidy that is given to the small agricultural societies. I do not fall in with that idea at all. The National Agricultural and Industrial Association, with which I understand Mr. Peek was once connected, might be able to do without a Government subsidy, but it has an attendance at its annual show of 30,000 people, and the net profit of the association last year was, I believe, about £1,375. I would be sorry, however, to see the little help which the Government gives to the small societies done away with. After all, the country shows do a lot of solid good, and, moreover, they are red-letter days in a district. Lots of people cannot come to Brisbane, and, to some farmers, the district show is the only holiday they have in the year. I would be very sorry indeed to see a suggestion carried out which would entail the doing away with the country shows. Speaking on the subject of the agriculturist and his Government, as dealt with by Mr. Fischer, I may here take this opportunity of thanking our Chairman for what he did for us in the matter of finding a market for our Cape gooseberries. To any gentleman who looks at this matter in a sneering way, I may say that big men start with small things, but that small men often start with big things, which get them down. The assistance that was rendered by Mr. Denham in the securing of a market for Cape gooseberries, and in the creation of a demand for that fruit, was of material benefit to the farmers of the Rosewood district, and also, I feel assured, to the farmers of many other districts.

Mr. W. Palmer (Bowen): In face of some assertions that have been made, I would be lacking in my duty if I did not acknowledge the benefit that our district has received from the Government experts generally. I should be very sorry indeed if those experts were not retained. They are not only required in Queensland, but it is acknowledged they are required throughout the world for the benefit of the various industries with which they are connected.

Mr. E. J. C. Barton (Brisbane): I feel myself at a disadvantage here amongst practical men, but even though I may be looked upon only as a theorist by some of you, yet the fact of my being a newspaper man has taught me to take notice of all that goes round, and in none of the industries of the country have I taken more interest than in those of the primary producer. That has been a part of my education, because the journals with which I am connected have always kept the basic industries to the front. There are two or three things that have called me to my feet this morning, but first of all I may say that, as the representative of the National Agricultural and Industrial Association of Queensland, I am rather at a disadvantage in not being, although a private member, one of the council of that body. I am, therefore, not fully informed upon the matters you might like to know about. No man ought to put in an exhibit which is not his own. I do not think anybody could possibly find fault with that contention, and I think it is one of those matters which have only to be brought before the council of the association to receive their full attention. No doubt a good deal has been said in connection with district exhibits—that certain portions of those exhibits did not come from the districts they were supposed to represent. As a matter of fact, however, these disputed portions generally are fully entitled to be exhibited in the collections they are found in. Last year there was a question about some wool that was shown in the "Moreton" exhibit. It was challenged, and the statement was made that there was no wool grown in the Moreton district. As a

matter of fact, however, there were a good many settlers in the Blackall Range district who have been experimenting with sheep, and where there are sheep I suppose there is wool. At any rate, those who were in a position to judge were quite satisfied that the wool was a *bonâ fide* contribution to the "Moreton" exhibit. Probably a good many of the supposed abuses have had a similar foundation. Mr. McKay wants a truer, purer, and better exhibition. I am quite sure that from what I know of the gentlemen consituting the council of the National Agricultural and Industrial Association they are only too anxious to make their annual show truer, purer, and better, and more representative of the whole State. I notice that Mr. Peek wants to start a new organisation altogether, and there is no doubt a good deal that is admirable on Mr. Peek's platform. But we should have to wipe out what exists and start afresh. It struck me, however, that it would be better to make the best use we can of what we have, instead of throwing it away and trying something new. These district societies are all doing the best they can. Why not lift them to a higher plane; help them to do better work? Then, take the National Association. We are told we want a National Show. I think we have it already, and I think we can make the National Show a good deal better than it is at the present time. There is no one more anxious to make it better than the members of the council of the National Association. I believe it was the National Association that devised the idea of the district exhibits which have so enlarged the scope of the shows that have adopted the system, as to practically revolutionise them.

Mr. Deacon: The idea was Professor Shelton's.

Mr. Barton: The district exhibits have been copied with success in Sydney, and at most of the big towns in both Queensland and New South Wales. It is a Queensland notion, and we want to see it extended, even though it is already one of the most important parts of our National Exhibition. Mr. Peek's paper is responsible for another idea that I would like to refer to, and that is, that the subsidy now paid to country agricultural societies should be withdrawn, and given to something else. Very naturally, Mr. Coulson resents that, as every district society would resent it. But in order to emphasise his remarks, Mr. Coulson referred to the National Association, apparently under the impression that it was a sort of fatted pig in the way of agricultural societies. As a matter of fact, the National Association does not get any assistance from the Government, barring the facilities that are granted by the Railway Department to visitors attending the show, and in connection with the carriage of exhibits. The only other matter I would like to refer to is a little remark that dropped from Mr. Fischer, for I think it is necessary to say a word about the looseness of expression that is growing up with regard to socialism. Mr. Fischer regards the Cape gooseberry assistance, the Government experts, &c., as illustrations of the grand time we are going to have when socialism in our time is at length realised. I need not tell you that that is not socialism at all. The Government's object in all these things is to help the individual; the object of socialism is to wipe out the individual.

Mr. E. Swayne (Mackay): I have noted that although this Conference is professedly, strictly non-political, yet that political organisation has been referred to, on more than one occasion, in the papers and the discussions. Will the motions carried at this Conference be given effect to? It is the universal opinion that the Government should give effect to the resolutions that are passed at the Conference, and I do not see how any of them can clash with the interests of any section of the community. Still, it is possible they may be so considered, and we should bear in mind that if any Government offends any section of the community by taking action on our behalf, the farmers should be so combined that they can more than make up for any harm that the Government would suffer by its action to assist us. We have heard many of the ills to which farmers are subject—long hours, hardships of various kinds, poor returns, &c. It seems to me that in organisation lies the

remedy for all. Through organisation we can sell our products, and get redress for any injustice that may be sought to be put upon us. The question of subsidy has been mentioned, and I certainly think it would be a great drawback were the endowment to outside societies withdrawn. Many of them do a good deal of work on behalf of agriculture. I know many societies who offer prizes for those who cultivate best, thereby directly encouraging a better system of farming within the districts covered by their operations. I know one association which has this year added £40 to the agricultural schedule, and most of that will go in agricultural prizes. Socialism has been touched upon this morning, and farmers are often accused of being socialistic. So far as I can understand, however, farmers never ask for socialism that interferes with individual action. Much of the socialism I have heard of does interfere with individual action, but the kind the farmer asks for leaves every man to work out his own salvation, and gives him the benefit of his own efforts.

The CHAIRMAN here expressed a desire that other speakers would confine their remarks to organisation.

Mr. W. G. WINNETT (Beenleigh) understood they were all assembled there because they were live members, who were sent forward to represent their respective associations. Most of them would therefore be aware of the apathy displayed by the ordinary farmer in matters affecting the local society organised to advance his interests. The average farmer would not attend meetings, and would not look after matters appertaining to his own benefit. Mr. Winnett hoped, however, that the delegates would go back to their districts with stronger hearts for the work of organisation in their particular districts. Many of those at the head of societies were to blame for not making their meetings interesting enough. They should demonstrate that the meetings were held for the farmers' interests, and then they would have less reason to complain of the apathy that was shown. He belonged to an association that did not draw any Government subsidy, and yet he believed that it did very good work. Still, for all that, the societies that ran shows could hardly get on without subsidy, and the shows did good educational work. Touching the question of the *bona fides* of many exhibits displayed at shows, Mr. Winnett stated that his society had been accused of displaying in its district exhibit at the National Show wool that could not have been grown in the Logan district. As a matter of fact, there were two delegates from the Logan district in the room that morning who both had sheep, and the wool that was questioned really came from Mr. Collins's station at Mundoolan.

Mr. J. M. HUNTER (Roma) said that organisation should certainly be encouraged, and to suggest that Government subsidy to agricultural societies should be withdrawn was directly opposed to the advancement of the organising of the farmers. The first organisation consisted in the farmers contributing each a certain sum of money whereby prizes might be offered which the farmers could compete for at fixed places. That showed that the idea was to stimulate among the farmers a healthy rivalry in the business which they were undertaking. At the show they met and compared their various products in such a way that their very meeting together increased the usefulness of the show, and, in the end, increased the profits of their own business. He did not think, if a vote were taken by all the agriculturists, that Mr. Peck's suggestion would meet with much favour, and he felt positive that, were the Government to withdraw the subsidy, a large number of the associations then existing would disappear. It was the impetus given by the subsidy that brought the associations into existence. In the partially settled districts, associations would be found organising, and it was only by bringing farmers together, and by their comparing notes, that they would succeed in bringing about the general organisation aimed at. From such organisations had sprung some of the most important combines which they had in Queensland at the present time. He, therefore, had no sympathy with any attempt to withdraw the subsidy from

the agricultural societies, as such withdrawal would do away with much of the societies' power for good.

Mr. E. S. Waller (Herbert River), in instancing the value of organisation, stated that the resolutions that they had passed at the Conference dealing with the sugar industry had been brought out entirely by organising a series of meetings by which the real wants of the sugar-growers were ascertained and crystallised in the resolutions.

Mr. R. S. Aiken (Bundaberg) did not in any way wish to take up the time of the Conference by getting up a controversy on socialism. His sole reason for writing the paper was in some measure to endeavour to make the primary producer realise his present position. He sincerely hoped that when the Conference was finished, and they had gone back to their respective associations, the papers they had heard that day would be discussed and reviewed in a broad and liberal mind. The great want was loyalty, and no matter what a primary producer's position in life was, even if he was the humblest farmer, they should be only too proud to know that a primary producer was walking the street with them. With respect to the question of Government experts, he could not allow any person to say one single word against his sincere friend Mr. Benson without entering a short protest. Whilst his friend might be the means, through the Government, of directing them to take a certain course, they must help themselves. They could not expect the Government to do everything for them, and, as a matter of fact, it was his humble opinion that they were over-governed. If ever their State was going to come to anything, private enterprise would do all that was needed. Therefore, as primary producers, he hoped that they would be loyal to each other, for he felt that, if they were, all things would end well.

Mr. F. W. Peek (Chamber of Agriculture) was very pleased with the discussion that had taken place on his paper, the more so as the discussion that had taken place on similar papers from him on previous occasions had not been quite so friendly. From this he felt that they or he were coming nearer to the mutual goal which they both were striving for. The only objection to his paper appeared to be the suggestion that subsidy be withdrawn from agricultural societies. His paper, however, gave a *quid pro quo* for the withdrawal. A society should, in the first place, be self-reliant, and he had stated that he would be favourable to the Government giving to the societies a lump sum of money—money for specific purposes. He quite disagreed with Dr. Macdonald's interpretation of his paper—that he (Mr. Peek) wished to hand his organisation over to the Government. What he did want was the Department to be part and parcel with them, and, with a sympathetic Minister at the head, a department able to carry their wants into effect.

Mr. C. F. M. Fischer (Zillmere) moved—"That this Conference appreciates the action of the Government in its endeavours to help the agriculturist, as indicated by the establishment of the amendment of the Agricultural Bank Act, and the Dairy Act, and various other ways, and urges the need of further help in the distribution of our products as present and future developments may indicate."

Mr. E. Swayne (Mackay) seconded the motion.

Mr. D. MacBrair (Sunnybank) thought the resolution unnecessary.

The motion, on being put, was carried.

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Mr. W. Palmer (Bowen) moved, and Mr. P. Hoskin (Hodgson) seconded—"That this Conference views with regret the necessity for economy, as displayed by the Department of Agriculture in connection with the issue or value of the production of the *Agricultural Journal*, and trusts that the Honourable the Minister for Agriculture may see his way clear in the near future to increase the reading matter contained therein to its original volume."—Carried.

NEW PROCESS IN SUGAR MANUFACTURE.

The Chairman drew attention to an exhibit of sugar from the Mosman Central Sugar Mill, which had been placed on the table. It was prepared under a new process, which it was hoped would do away with the necessity of the sugar being sent to a refinery. It was a secret process, and the only particular he could get concerning it was that it was an electrical process. He had seen vacuum-pan sugar produced pretty well as good as the sample, but in the latter case the waste had been so great as to render the system unprofitable. It was claimed, however, that in the Mosman process there was no perceptible waste. Of course, if sugar could be produced without the intermediary of a refinery, it would be a great thing for Queensland, and would be a step towards the accomplishment of that which they were all hoping for—namely, the carrying on of the industry entirely by white labour.

MINIMISING DROUGHT EFFECTS IN QUEENSLAND.

[By W. Hammond.]

In my endeavours to fulfil the conditions attached to the acceptance of a free pass to and from this Conference—viz., by writing a paper—I feel that I should be an indifferent exponent of any subject that I might claim to understand, but, when in addition to this, one knows, as I do, that there is really only one subject upon which I can speak with any security—viz., "Minimising Drought Effects in Western Queensland"—it follows that I must confine myself to it and crave your indulgence for this my first effort of its kind.

As I have been in the Western portion of this State since 1883, I may fairly claim some knowledge of it. As you all know, this very large tract of valuable stock-raising country has lately been suffering from the worst drought in the memory of its oldest settlers; in fact, I regret to say, that a considerable portion is still suffering, and the outlook for the next summer is not very cheerful at present. There are two well-known political sayings in this country: one is, "The splendid natural resources of this country"; and the other is, "The normal condition of this country is drought."

I need scarcely say that both expressions are seldom used by the same kind of politician; both sayings are quite in accordance with facts, but they differ in effect, so that, while in good seasons the "splendid resources" are easily able to look after themselves, the "normal condition of drought" in its seasons, on the other hand, taxes to the utmost the energy, enterprise, and courage of those who reside and are interested in this portion of Queensland.

As the pastoral is the greatest of all the Australian industries, and as Western Queensland is decidedly an important portion of the continent, it follows, to my mind, that every resident who possesses social or political influence in any degree should look upon it as his duty to help in any endeavour to combat the evils of its normal condition of drought. When the Western country flourishes, nearly all Queensland is prosperous, and especially the large centres. My own experience is that, for every year of proper increase in stock, we have three years of either no increase or else a decrease in numbers, if any one district in the West is taken separately.

This being so, I contend that in ordinary droughts, which perhaps seriously affect only some portions of the State, whilst others are experiencing a good season, a connected system of light railways all over the West would be a great factor in saving what I may term "national wealth" in the lives of many hundreds of thousands of sheep and cattle.

It is almost incredible to think that a period like the last seven years could be successfully negotiated without loss of stock, but I believe that Queensland with connected light railways would have saved 12,000,000, chiefly ewes, out of her 19,000,000 sheep, instead of the remnant of 7,000,000 that she is left with. This would mean a recovery to the old prosperous numbers by the end of 1906, instead of about the end of 1910, as it will now probably be.

My contention is that, with light lines everywhere, valuable flocks and herds could be either sold to other people in other parts of the State or saved by an expenditure of money that would, at any rate, save their lives and so make them producers again when rain should fall. Were this an accomplished fact, in good seasons the splendid natural resources of the country out West would be employed for creating a new and sounder prosperity, and not, as they invariably are nowadays, in recovering old leeways.

We cannot prevent droughts occurring, but I think light railways would greatly reduce their subsequent effects; they would, perhaps, increase the stock-owner's expenses, but would so increase his security from possible collapse and ruin that he would be easily able to afford this.

If politics could be forgotten and urgent matters like this and others that have been brought under your notice here could be dealt with by our ablest men, free of all political and class bias, what a prosperous community we soon should be.

I believe that, if light railways were connected in our Western portions, and taking the last drought as a maximum drought, three good years would enable us to recover our stock numbers after our most serious dry spells, and also that minor droughts would scarcely be felt at all by the greater portion of the population.

I believe also that these lines would soon be accomplished facts if the powers that be would look at the question as the Japanese do their war question—*i.e.*, with one object only in their mind, and that object the prosperity and solidarity of their people.

Light railways are an absolute necessity in the West, both for the development and preservation from drought effects of the pastoral industry as a whole, and also for the development of the undoubtedly great mineral wealth that lies waiting to be extracted from some portions of it.

I am glad to see the Cloncurry Railway is likely soon to be commenced, as it will make the Gulf available, and it is indeed a step in the right direction; but, being a pastoralist only, my point is to urge, as strongly as I can, the importance of a connection of the railway system in the West as well as an extension of it.

I have been told by men in a position to know that about £1,000 per mile would build lines such as I refer to; so that they could carry live-stock trains, even at an 8-mile speed on an average, and thus would attain the object I am advocating.

It is of vital interest to the West that the need of light railways should not be lost sight of in the immediate future; if it is, the next great drought—and it is the only thing in the West you can be certain is coming—will find us in the same helpless state as we were in the last.

When everything was done that we could do, it still did not rain, and the stock—the result of years of labour and energy and hope—perished.

I make my strongest point on this subject, that the question requires immediate and continual thought and action for our future protection against droughts. If this matter is not kept continually before those in power, the luxury and prosperity attendant on a few good seasons will show that the wonderful natural resources of the country are apt to make us forget that the normal condition is "drought," and so these resources become our worst enemy instead of our greatest benefactor.

The Chairman said they could very well group for discussion with Mr. Hammond's paper the subject of irrigation, which was to be introduced by Mr. J. M. Hunter of Roma. He therefore called on that gentleman for his remarks.

IRRIGATION.

Mr. J. M. Hunter (Roma): It is not that I claim to know very much, or, indeed, that I know anything at all, about the matter that I am introducing it; but I thought that, were the subject once placed before the Conference, there would be found amongst us numbers who would be better qualified to give opinions and offer advice. All I know, in a general way, is that, in a place like Queensland, there can be no success, off the sea border, or permanent progress, unless we have some system of conserving water to irrigate our lands. Irrigation is not a new question, as we all know. We can go right back into ages past and find the conservation of water one of the chief concerns of ancient people. To intercept water and to distribute it when we have an ample supply is, it has always been admitted, a very expensive thing to do. At the same time, it almost invariably gives big returns. Lands which hitherto were useless have become the most prolific lands when treated in that way. When we have, in our Western country, a climate which ensures greater success from irrigation than would result in cooler regions, and an ample fall of rain to provide for irrigation, then I think it is the duty of the people to consider whether the time has not come when some kind of experiments should be

made in the matter of irrigation. I know a good deal of success was obtained in the Western country during the drought, but that only happened to those who had a big supply of water through artesian wells. But, in a great many instances, the beneficial effects only lasted for a few years. The ground seemed to become impregnated with minerals that appeared to destroy the growth of anything planted in it. Indeed, the only good result I know is that a permanent supply of couch grass seems to take possession of the ground. We know what a hardy plant that is, and, in fact, many of the irrigation plots in the West have almost become pasture lands covered with couch grass. In my district we have some very fine land running for a distance of 40 miles from the railway along channels which, I think, could be very well dammed, and which would give a supply of water sufficient for irrigation purposes, and, at the same time, prove a means of carrying the products to the railway. I do not know along the whole of the 600 miles along which the Western line runs a watercourse better adapted for irrigation than the magnificent channel of the Maranoa River, although at the present it is only a sandbed. It has a breadth of something like 50 yards, a depth averaging about 12 feet, and on each side of it for miles is beautiful land sloping back from its banks, which could be utilised for irrigation purposes. I only mention this as an instance that I know of. I know there are other places where water could be impounded and distributed in a way that would transform what are at present useless areas into profitable lands. It is a question for consideration whether, by irrigation, we could not get a larger return for the money expended in providing against drought than by the establishment of light railways. At the same time, I believe that light railways would eventually come from the necessity of providing an outlet for the productiveness that must take place in the Western countries where irrigation was successful. There have been several instances of successful irrigation in Australia, and we have had one or two in Queensland. Both Mildura and Renmark are, I think, beginning to show some return for the money that has been expended on them. Then there is the irrigation settlement Belhus, on the Swan River, in Western Australia, which has given excellent results. We have in our midst a gentleman from Allora, who set up a plant alongside a waterhole, and succeeded in irrigating a portion of his farm, thereby providing for the whole of his own stock sufficient to keep them in first-class condition, and supply his neighbours with the surplus at a highly profitable figure. I believe that plant has paid handsomely, and justified the expenditure which Mr. Rickert incurred in connection with its establishment. I simply desire that the opportunity should not now pass of allowing those who know more about this subject than myself coming to some conclusion as to the desirability of adopting some measures to have irrigation experiments attempted in our Western country. I believe it would succeed there better than anywhere else, and the West, moreover, is the place where irrigation is wanted rather than on the coast.

Mr. B. T. McKay (Maryborough): Personally, I favour light railways for the West, and think I can prove to you that irrigation would practically be of no benefit whatever to that portion of Queensland. Sixteen years ago I was manager of a steam-plough works at Leith, in Scotland, and we had some orders from Australia for some ploughs that would plough 4 feet deep. These ploughs were driven by a 16-horsepower engine, and vast tracts of land were ploughed with them, with a view to making watercourses to water stock. Although we sent four of these ploughs to South Australia, and they were used there, there were no repeat orders. When I came to Australia I made inquiries, with a view to ascertaining why no more of these ploughs had been ordered, and learned that the natural evaporation caused by the sun was about 1 foot per annum, so that the water that could accumulate in a 4-foot ditch made by a plough was not of much use. Judging from the results of that experiment alone, I think that irrigation on the flat plains of the West would not be of much use to the stock-raiser who, I think, would be better served by light railways. We have not arrived at the stage of irrigation. I

favour the word "conservation." Great Britain is covered with canals. Even speaking from an agricultural point of view, canals are a most important factor in the prosperity of a country. Take the transport of chaff for instance. The bulk of such a product is enormous, and the railway expenses for its transit are great. But when you can put 200 tons of it into a punt on a canal, which is in charge perhaps of some widow woman, you can realise what cheap transit means. There are thousands of products in England it would be impossible to transport without water carriage. Very nearly all the bricks in England are transported by water. Bricks in England are about 15s. per 1,000. They are about 30s. per 1,000 in Australia, which shows what water carriage can do in the matter of reducing costs. There never was a country so favourable for conservation as this country. From my experience, irrigation in this country consists of sinking a well and irrigating from it. I have a good well, and got water from it, but I remember putting some water on to a couple of orange-trees, which have done no good since. I have never, however, yet known a case of a man who irrigated with water that came from the heavens being unsuccessful. When I talk of conservation, I mean the act of going along our valleys, finding those with narrow openings, and damming them so that we may collect the water that flows into them. The great canals in Great Britain are supplied from reservoirs. These reservoirs are nothing more than slight indentations which have been dammed. They have them every 5 or 6 miles. When you see one of these reservoirs, you will see at one end a boiler and a pump throwing about 10 inches of water every time it lifts, and so giving a continuous supply of water for the canal. When building a canal, it would be necessary to apply some form of the betterment principle. I might also say that where you have the canal it has to be paid for. The way in which the revenue is raised from the canals in Great Britain is this: Supposing you are a manufacturer, you are charged £1 per annum per horse-power. That enables you to take all the water you want for your engines. You return the water, but, of course, you could not return water used for irrigation. I desire to move that—"This Conference is of opinion that, when the Ministry are considering the question of employment of the unemployed, the matter of forming large reservoirs of water, by the formation of dams, to provide water for irrigation, and so increase the value of the land, should be considered."

Mr. R. S. Aiken (Gooburrum) seconded the motion.

Mr. G. A. Ball, of Killarney, was more than pleased to hear the remarks that had fallen from the last speaker. Mr. McKay had touched the vital point in irrigation, and that was, conservation; for, without the latter, irrigation was impossible. Many people were only too anxious to irrigate, but the water that was necessary for irrigation had flowed on. At present a few little Californian pumps on the side of the mighty Condamine were quite sufficient to exhaust the natural supply that came from the adjacent hills; but, were there a means of storing the water that flowed away in the Condamine, such water would be worth many thousands of pounds. Such water would have saved a large asset in the shape of the stock of the country, for it would have been the means of allowing large quantities of fodder to be grown which could have been distributed to all parts of the State.

Mr. A. Rickert (Allora) said that, as he had been referred to by Mr. Hunter in connection with irrigation matters, he might be pardoned for giving a few particulars of his experience with irrigation during the last big drought. They were then just as much drought-stricken in the South as they were in the West. They had, however, some fodder stored up which they could have sold at high prices, but which they had to refuse to sell because it was required for their own stock. Yet most of the stock perished in the end, and all for the want of irrigation. But before he allowed his stock to get too low, and he saw the last of his stacks going, he realised that he had been asleep all the time, and woke up to the fact that he had water in a creek that he had never used, believing that it was altogether out of his reach for irrigation purposes. He had thought

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one carting firewood from the bush, and a third in the field. That was all the labour he required to irrigate 120 acres of land. If he were assured of good prices, he would keep the plant going; but, unfortunately, he did not know what to go in for that would reimburse him for the extra expenditure. Wheat would hardly pay to irrigate at ordinary prices; but vines or cotton might, or, in fact, anything that grew in rows. He had raised some splendid tomatoes this year with the aid of irrigation.

Mr. W. Deacon (Allora) said that at the last Conference he had brought up the matter of riparian rights and the necessity for defining the law with respect to natural water. At the Maryborough Conference, in 1903, he had moved that the Conference request the Government to introduce into Parliament a bill to declare and define the law with respect to natural water. Before the practice of irrigating from creeks was generally adopted, legislation would have to be introduced because one single farmer could exhaust, by irrigating, all the water from a creek. At the last Conference Mr. W. D. Lamb, of Yangan, had referred to the friction that occurred amongst neighbours by one farmer making raids on the water in a stream that was more or less common to several. If irrigation, apart from a few isolated cases, was to be gone in for at all in Queensland, the matter of water rights would have to be very clearly defined, and there would have to be conservation. Irrigation was a big thing, but it was a thing that would make Queensland one of the biggest countries in the world, and Mr. Deacon pointed to what had been done in India in support of his contention. There, millions had been spent in irrigation, and although the system had not been sufficient to stave off famines, yet it had done an incalculable amount of good.

Mr. E. Swayne (Mackay) stated, in reference to Mr. Hunter's remarks, that he remembered once, when travelling up the Maranoa in a very dry season, that he had found what might have been fairly termed a howling wilderness. In fact, he thought it the most barren piece of country that he had ever seen. The following year he had travelled over the same country after a heavy fall of rain, and could not recognise it owing to the influence of the water. It seemed to him that the Maranoa district could be turned into first-class farming country by the application of water.

The Chairman: Would it pay?

Mr. Swayne thought the question was worthy of the consideration of the Government. With regard to light railways, they had them in Mackay, and he had seen places where railways could be put down with the aid of a plough and a scoop. In fact, he had seen a line so formed carry 80,000 tons per annum, and then it was lying idle for three or four months out of the twelve. Such a railway would not cost more than £600 per mile.

The Chairman said he had inquired at the Herbert, and found that they could not put them down there at much under £900 per mile.

Mr. Swayne knew one which had to cross gullies, &c., and it had cost only £800 per mile. They already had an Act which defined riparian rights. By it no one was allowed to divert the water from a running stream without the consent of the Governor in Council, but when they came to tidal waters the provisions ceased to have effect.

Mr. J. C. Brünnich (Agricultural Chemist): The most important factors which have to be considered in connection with irrigation are water, soil, situation of the land, and the crops to which the irrigation has to be applied. On water and soil I will say a few words, and Mr. Benson can give you some information on the other points from a practical point of view. With respect to water, the most important point is to obtain sufficient quantity and good quality of water at the least cost. It is not every water that it fit for irrigation. Many well and artesian waters are quite unfit for such a purpose, and others can only be used with caution. Many waters have been used which apparently gave satisfaction for a year or two, but then ill-effects began to

that irrigation was a most difficult thing to carry out; but, when he saw starvation staring him in the face, he took the measurements and bearings of his creek and land. He then went to Brisbane and bought a centrifugal pump and engine. With these he started to irrigate a lucerne paddock that he had, and the water flowed just as he had expected. In six weeks' time he had sufficient fodder to feed the whole of his 100 head of stock, and that was from 80 acres of land, yet, before he started irrigating, he could put the handle of a fork down 6 feet into the cracks in the soil. It was only a small creek, and did not run much, just such a one as is to be seen in hundreds of districts. He did not altogether agree with Mr. McKay in his estimation of the practicability of irrigation. When a man pumped water from a running stream, the stream would as often as not stop running; but still there was an undercurrent of water, and if he did obtain the water for irrigation purposes, he would probably be able to save his stock and keep his farm for growing maize and other products in the face of not a drop of rain. The year Mr. Rickert had alluded to, he started very late in the drought, when the ground was very dry; but he was soon in a position to raise as much maize, potatoes, pumpkins, and vegetables as he required. What he desired to impart to this fellow delegates was, that there was a great deal of room for individual enterprise with respect to irrigation. There were thousands of acres of land in the State that he would undertake to irrigate.

Mr. B. T. McKAY: You have a creek.

Mr. RICKERT said a lot of artesian water was good for irrigation, and there was artesian water in a small way in his district. That particular artesian water was suitable for irrigation purposes, for he had tried it. Irrigation should be more recognised by the farmers already settled on the land. His creek was only a tributary of the Condamine River. From such creeks, which were quite capable of being dammed up, millions of gallons of water passed through drought-stricken countries down to the Murray and were never utilised. His irrigation plant cost £300. The pump, with a 10-horsepower double-cylinder engine, drew 33,000 gallons per hour. It had a 6-inch pipe, and at the time of the drought, when things were very dry, he was able to irrigate from 2 to 3 acres a day. He planted pumpkins when the ground was so hot that he could not stand upon it. He planted 8 acres with pumpkins, and in three months' time had a 100-ton crop, although there had not been a drop of rain to moisten the soil. He put in 14 acres under maize. His horses were so low that he was unable to plough the land; but he got by irrigating three times, in five months, an eight bag per acre crop, and it was only through the want of cultivation that it was not greater. The potatoes he raised were far superior to any he had previously grown under natural conditions. One beauty about irrigation was that it enabled one to apply water just when the crop required it. Down at Allora he had grown maize with stalks 10 feet high, and capable of producing a twelve bag per acre crop. Yet just when the maize was tasselling, it required an inch of rain, which it never got. This was before he had installed his irrigation plant. The maize crop was, consequently, for the want of that inch of rain, a practical failure. With irrigation, on the other hand, you have always the means available for applying the impetus necessary to mature a crop. He applied the water to his land by gravitation. His land was so situated that there was a fall of the country from the bank of the creek. The fall was about a mile an hour, that being the rate at which the water travelled, and he made his drains sufficient to carry 33,000 gallons per hour at that rate. When he started irrigating his maize, he dammed up a main drain with a board, and let the water out into about half a chain of land. The land was then watered until the maize was thoroughly soaked. He would have another board and put it down another half-chain further along. Then removing the first board he watered the next half-chain of land, and so on till the whole field was irrigated. Such a system was simple, merely requiring one man at the engine,

appear. Waters which contain minerals, particularly chlorides and carbonates of soda and potassium, are generally unfit; but it is very difficult to determine and state at what amount of these ingredients the danger limit begins. This danger, moreover, is to a large extent controlled by the quality of the soil to which the water has to be applied. The Sugar Experiment Stations Bureau has, I believe, carried out several hundreds of analyses in connection with waters suitable or otherwise for irrigation, and the results generally of the tests will be found in the reports issued by the bureau. With regard to the soil and subsoil, the mechanical composition of both is, of course, most important. It would never pay to irrigate a really poor soil. The composition must be looked into in order to be able to know if certain waters can be used; if the land is already rich in chlorides of magnesia and soda, as many of our soils are, the quantity of either in the water must be comparatively less, or we will soon perceive ill-effects. The mechanical composition of the soil is of the greatest importance. The first thing is capillarity—that is, the power of the soil to "draw up" water—porosity—to hold water to a certain extent. Now, good capillarity and porosity are generally found in light, loamy, and in volcanic soils. But it is not sufficient that the soil should be in good mechanical condition—the condition of the subsoil is of equal importance. If the subsoil is heavy and impervious, the land is quite unfit for irrigation, for the water will accumulate on it, and plants remaining in contact with stagnant water must perish. The foregoing are, rather briefly, the principles which have to guide us in irrigation from a theoretical point of view.

Mr. A. H. Benson (Instructor in Fruit Culture): As has already been mentioned here this morning, the keynote to the irrigation question is the supply of water. It is really a commercial question, and anyone considering it must first ask—Is it going to pay? We have to find the cost of the water, and then the question arises, What crops can we grow with water that costs so much? Then there is the further question, Whether it will not pay to spend a certain amount of money to obtain (or, rather, to conserve) water in the Western and similar countries as a means of ameliorating the very disastrous droughts that periodically occur in such countries? I had a good deal of experience with irrigation in California, and I started two irrigation farms in New South Wales, but I think that, rather than go fully into the matter now, it will be my better plan to write a series of articles for the *Agricultural Journal* dealing with the question thoroughly. This subject, like many others, would take me many hours to deal with. The Government has recently taken the matter in hand seriously, and I was a few weeks ago sent to Barcaldine and Emerald for the purpose of investigating the quality of the land there, with a view to reporting on its suitability or otherwise for irrigation. The Hydraulic Engineer was seeing, at the same time, to the matter of the supply of water. There are places in Queensland where we can get first-class returns from the application of water, but the first thing is to get the water, then to apply it, and then to grow the crops suited to the particular district and capable of bearing the expense of irrigation. One big factor to be considered is that irrigation, as irrigation, is a very expensive method of using water. Irrigation and cultivation must be combined. It is the combination (and the former is wasted without the latter) that has made the Californian fruit industry, and it is cultivation and irrigation that will be the means of solving, to a certain extent, our drought problems in Western Queensland. In California they get their water by the damming of the water from the natural watersheds. There are many places in Queensland, to my knowledge, where, by means of dams, large bodies of water could be thrown back and made available for irrigation purposes.

Mr. B. T. McKay: Apple-tree Creek, at Childers.

Mr. Benson: It is done in the Welsh mountains in Great Britain. But there is a possibility of conserving water in natural basins, to be distributed thence, which would tend to ameliorate our drought conditions in the West.

It is a matter of pounds, shillings, and pence, and the question of whether it is going to pay has to be taken into consideration from first to last. We can conserve a certain quantity of water, and if we can do it at a rate which will pay, then we will be solving a question which will be of the greatest importance to Queensland. The Nogoa River, from which it is proposed to take the water for the Central district irrigation experiments, is like the Condamine. At certain seasons it comes down in flood; at others it is a series of waterholes. There is a waterhole at Emerald with an outlet of a creek. It is proposed to dam this creek, and so raise the water 3 or 4 feet. This will conserve 40,000,000 gallons of water, which will irrigate 400 acres for four months and, in addition, supply the town with water. We reckon, taking the average rainfall and the rainfall of the watershed of the river, that we can depend upon the waterhole being filled every four months. Mr. Henderson has calculated that, with the supply from the waterhole, they could stand eight months without a drop of rain. I went to see whether the soil was suitable, and, not only that, but to see whether we could get the water on to the land at a reasonable cost. The means for the distribution of water on to the soil is a question that would take hours to go into, and, as I could not, in the time at my disposal, make you understand the technique of the manufacture of ditches, I shall not touch upon them.

Mr. A. W. Cameron (Maryborough): I have been asked to move the following resolution—"That this meeting strongly supports the building of light lines in the West of Queensland, and the connecting of the railway systems, with the object of assisting to save livestock in droughts, and of developing the country generally at a minimum cost in rolling-stock."

It does not require many words to say what would happen if we had our railway systems to the West connected, and the lines themselves thrown out further West. I was at Clermont at the time of the disastrous drought of 1895, and but for the railway system, which had then recently been brought to Clermont, the pastoralists there would have lost thousands more stock than they did. It is rarely in Queensland that a drought affects the whole State at one particular time or in one year. Therefore, if you can ship stock from drought-stricken portions to country where grass is to be had, you are in the position of being able to save your stock, and the cost of moving them by railway is not much greater than moving them by road. When the drought strikes the West properly, there is no chance of shifting stock by road, because the roads are practically closed. Unless you have means of transport by railway your sheep and cattle must die, and the loss to the State is simply enormous.

Mr. R. S. Aiken seconded the motion.

The Chairman: The questions that have been introduced are of vital importance. Irrigation is gradually extending in the State. In 1894 there were 5,846 acres under irrigation, and each succeeding year there has been a slight increase, until in 1903 there were 14,000 acres under irrigation in the State. To make a general application of water to districts, either by the construction of weirs or by lifting the water from below, involves such a cost as to make it almost impossible to profitably use the land thereafter. Here is an old report, presented in 1890, and I notice it contains an estimate of the cost of three timber weirs in the Condamine River, and of irrigation in the Warra and Chinchilla district. The total estimated cost for the three weirs, the centrifugal pumping machinery, boiler, buildings, erection, construction of main channels, flumes, culverts, and various headworks, is £75,665, which represents an outlay of nearly £4 15s. per acre on the 16,000 acres of irrigable land that would be included within the scope of that particular irrigation scheme. Whether settlers would be prepared to have that initial cost added to the purchasing price of their land, and whether from land acquired on such terms they would be able to raise crops profitable to themselves is, I think, very doubtful. There is, moreover, afterwards, the continuous cost of distri-

buting the water. Quite recently, under the irrigation vote, a well was sunk in the Southern part of the State. We struck the water all right, but it does not pay to lift it. It is all a question of cost, and the scheme at that particular spot has been abandoned. Then we come to the instance of Messrs. Gibson and Howes' plantation at Bingera, where the right to use the water from the Burnett was granted under a special Bill. There the results have been so far profitable, I understand. The great thing in irrigation is in being able to obtain and apply the water at a payable rate. Mr. Rickert was able to do this, but if his neighbours had done the same as he did, it is improbable that there would have been enough water to go round amongst the lot. It appears that a pump capable of raising 20,000 gallons of water per hour, or 160,000 gallons per day of eight hours, will irrigate 2 acres of land equal to 3 inches of rainfall. The cost of lifting so much water must be so considerable that I have my doubts whether it would pay, in many parts of the State, to go in for irrigation. Millions of pounds have been lost in Victoria, and even now they have not yet got it in hand, except perhaps in Mildura. Although it is highly desirable for those who have the opportunities (as possibly may be the case in Emerald) to avail themselves of their advantages, yet before application is made for assistance any scheme proposed should be practicable. The cost should be worked out. In specially situated places irrigation might be justly contemplated, but its initiation in the State as a general scheme would involve an immense amount of money, and I question whether the State would be justified in undertaking a comprehensive scheme. The construction of light railways would, I admit, largely solve many of the problems that the Western pastoralists have to face. If the transcontinental railway had been in existence millions of sheep and cattle would have been saved during the last drought. There was at the time an abundance of grass in the Gulf country, and stock could have been brought up from the South and Centre to feed on it. Sooner or later there will be a linking of our three railway systems, and when there is, I think, every one will agree that it will be to the advantage of the whole of Queensland. It appears to be quite competent for this Conference to send on two such resolutions as these for the authorities to deal with.

Mr. J. M. Hunter (Roma): In connection with this matter, I was rather surprised to hear Mr. McKay say he was opposed to irrigation on account of the evaporation, and then proceed to say he approved of conservation, and suggest the building of canals. There was a strange contradiction in Mr. McKay's speech, which I could not understand, but I think he is with us all the time. In some districts it has been found necessary to put down bores.

The Chairman: For stock.

Mr. Hunter: For people. I am speaking of providing water to permit of people remaining on the land. If Wallumbilla had been without a bore they would have had to abandon the settlement there. With respect to Mr. Cameron's motion, I believe our railways would get larger traffic by the carrying out of the idea contained therein, and by the inauguration of irrigation in many parts of our Western lands. I would now like to move—"That in the opinion of this Conference the Government of the State should take into consideration the practicability of conserving water, with a view to experimental irrigation."

Mr. W. Deacon (Allora) seconded the motion.

Messrs. McKay's, Hunter's, and Cameron's motions were then carried.

Mr. A. H. W. Clarkson, of the Queensland Beekeepers' Association, then read the following paper on—

SCIENTIFIC QUEEN-RAISING.

[By A. H. W. Clarkson, Secretary, Queensland Bee-keepers' Association.]

"Upon no other one thing does the honey part of the apiary depend so much as it does upon the queen. Give me a good queen—one which can be brought up to the highest production of eggs just when we want them—and I will show

you a honey crop, if the flowers do not fail to secrete nectar; but with a poor queen—one that you must coax for eggs, to little or no purpose at the right time—the flowers often bloom in vain, even when the honey secretion is the greatest." Thus writes Doolittle, the greatest authority on queen-rearing. And this is perfectly true, as all experienced bee-keepers will admit, for in no one thing does quality count for as much as it does with the queen or mother bee. The question therefore presents itself: "How are we to raise these high-class queens?" and the answer is: "By rearing queens in strict accord with Nature's laws, and not by breaking these laws, which at present is the usual way."

In their natural state, and, therefore, working according to Nature's laws, bees have two ways of rearing queens—viz., when swarming is intended, and when an old queen is to be superseded. Under both conditions the colony is in a normal state, and honey and pollen are both coming in freely. In both cases, the old queen is present, and there is no hurrying to replace a lost queen, as is the case when the colony is thrown into an abnormal state by removing the queen—which is the common way of raising a new queen—thus forcing the bees to raise a new queen at a time when, under ordinary circumstances, it is the last thing they would think of doing. In other words, the majority of bee-keepers, when they want more queens, do one of two things: They either remove a hive from its stand while the bees are out working, putting a new hive in its place in which they have fixed a frame of young larvæ from their best queen; or they place two or three frames of brood bees and honey into a nucleus, and set it on a new stand. The former is the worse plan of the two, for the old bees that were out gathering honey when their hive was removed are not nurse bees, and are the most unsuitable for feeding the larvæ; they have passed that stage, and only act as nurse bees because they are forced to do so. In the latter plan the probability is that the nucleus is too weak to rear queens of the best quality, and in either case the bees have, as I have said before, been thrown into an abnormal state, and, in their hurry to get another queen, start dosing larvæ, that under any circumstances are far too old to make good queens, with royal jelly.

Before proceeding to describe the two best known methods of rearing queens, I would like to impress upon those about to try their hand upon this most interesting branch of apiculture one or two facts which are of the utmost importance if they wish to succeed. In the first place, it is utterly useless to attempt to rear queens in any but the strongest colonies, otherwise failure must follow. To try and rear queens in weak nuclei is but to court failure, for such nuclei cannot give the lavish quantity of food required, neither can they give sufficient warmth, and the result will be poor, half-starved, half-worker queens of a bad colour. I have seen queens so reared from good Italian queens hatched almost black, while the ordinary workers, from the same queen, were a beautiful golden colour—in fact, all that could be desired in colour. In the second place, to secure the best queens, they must be reared from the very best stock. By "best stock" I do not mean merely the best from a colour point of view, although that is of some importance, especially if the queens are being raised for sale, but I mean the best from a honey-gathering point of view. The colony that worked best through the past season came out strongest at the end of the winter, and was the first to start storing honey in the top story; this is, the best colony from which to raise the young queens, for if properly raised they will take after the queen from which they are raised. It was the queen in that parent hive that was responsible for their doing so well. The very best queens that can be got are those raised for swarming at the beginning of the season. They are vigorous because they come from a vigorous colony. Should honey not be coming in, feed the queen-rearing colony with half a pint of syrup each night. Now we come to the actual raising of queens. The following method is not quite according to Nature's laws, inasmuch as the queen is not present while the young queens are being raised, whereas (except in very exceptional cases) she always is present in the hive when queens are being raised naturally. Although, as I said before, it is not quite in accordance with Nature's laws, still it will produce the best queens that can be reared by any method not in strict keeping with these laws. By best queens I mean those that will lay from 2,000 to 3,000 eggs a day at the right time of the year. The method is—make a strong colony queenless. In three days they will have started queen cells, when all the brood should be removed, leaving only combs with honey and pollen. This means that the bees which up to now have been feeding thousands of young worker larvæ are obliged to hold the accumulated food in their stomachs, and feel great anxiety for a queen, and are thus prepared to rear as good queens as it is possible to obtain without the presence of a queen. The hive should now be closed up while the queen cells are being

prepared for the queen larvæ. A number of frames for queen cells should always be kept on hand. They are prepared as follows:—Across the middle of an ordinary frame, put a bar. Fill the top half with foundation comb, and place in a strong colony; when the comb is built out and filled with honey, the frame is ready for use. Of course, this part of the business must be done some time beforehand. The frame is then ready for use when required. Having thus got the frame prepared, get a piece of new drone comb and cut it down to one cell wide, trim it down on one side to within two-thirds of the bottom of the cells, and fasten the side not cut with melted wax to the cross-bar. Now take a clean piece of pine and trim it till the end is just the size of the bottom of a queen cell, put it into every other cell, and twist it round gently a few times, when the drone cell will be converted into a queen cell. Into each of these newly made queen cells place a small quantity of royal jelly. Next, from the colony containing the best queen, take a frame of brood containing young larvæ, and with a goose quill toothpick transfer young larvæ, not more than thirty-six hours old, into the prepared cells, when they should be immediately given to the queenless colony that has already been prepared for them. These queens will hatch out in from eleven to twelve days. To prevent them getting a chill, the transferring should bedone in a warm room. Special instruments are now made for transferring both royal jelly and larvæ into the queen cells, but a quill or piece of section box answers the purpose very well. Should drone comb not be available, queen cells can be made as follows:—Prepare the stick as for enlarging drone comb. It should be exactly the same size as the inside of a queen cup, and nicely sandpapered. Over a lamp melt a small quantity of beeswax. About nine-sixteenths of the way up the stick from the top make a pencil mark, dip the stick into cold water, then shake it, then dip it quickly into the wax up to the pencil mark, twirl it round and round quickly so as to distribute the wax evenly over the wood; when it is cool, dip it in again, only not quite so deeply; repeat this operation six or eight times, dipping the stick not quite so deeply into the wax each time, thus a cell will be formed thick at the base and thin at the top. The last time it is dipped in the wax hold the base against the centre of the cross-bar; as soon as the wax is cool, draw out the stick, when the cell will remain in position ready for use. To get the ebst results, not more than twelve or fifteen cells should be given at one time. Many people prefer cells thus made to those made from drone comb, but the latter are made more quickly.

We now come to the method which is strictly in accordance with Nature's laws. In adopting this method, in the first instance it is necessary to make a hive queenless in order to obtain the royal jelly. The frame of queen cells with royal jelly and transferred larvæ is prepared in exactly the same way as in the previous method, but instead of giving them to a queenless colony they are given to a strong colony working vigorously in the top storey. Before giving them to this colony, remove a couple of frames containing young larvæ from the lower to the upper story, put a queen—excluding wood and zinc honey-board—between the bottom and top story, and the frame of queen cells between the two frames of brood. The bees finding the brood is not increasing in the top story evidently fancy that the queen is failing, and raise a new queen in the upper story to supersede her. It will be clear to all that this method of raising queens is in accordance with Nature's laws, the bees are in a normal state, and they have their queen present, so there is no hurrying over the business. Not only can queens be reared thus in a top story, but, by making a small hole at the back of the hive as a means of exit, a queen will go out and get fertilised, and return and lay in the top story, provided always that a little brood is kept in the top story; but should she by any means get into the lower story, she will immediately destroy the old queen, no matter how strong or how valuable she may be. Should the apiarist not remove all the cells but one from the top story before the due date of hatching, the first queen to hatch will destroy all the others. To prevent the new queen in the top story laying in all the frames which are being used for honey, it is well to put perforated zinc between two frames on which the queen can lay, and the rest of the frames. A wire gauze, the width of two frames, should be tacked across the honey-board, thus leaving a space between the top and lower story. This prevents the queens fighting. When the queen has started to lay, the hole at the back can be filled up with a cork. The best of this method is that frame after frame of queen cells can be raised, the queens fertilised in a top story without in any way interfering with the colony. The old queen down below laying all the time. Of course, this method will hardly suit those who raise queens by the hundred for sale, as they want them early in the season when few hives will be working in the top story. Should the

bee-keeper want the queen in the lower story superseded, all he has to do is to remove the honey-board, so that the young queen can get down to the brood chamber, and she will soon destroy the old queen.

Having got the queen cells sealed, the next matter to be considered is how to dispose of them so as to get the young queens fertilised. One method is to cut out the cells and place them in small cages, eighteen or twenty-four of which fit into a small frame; these are put into the middle of the brood chamber, where they hatch, and the young queens are then used as required; but I am convinced that this is a bad method, and that the better plan is to leave them where they are until forty-eight hours before they hatch, when the cell can be cut out and placed in queen cells protectors; they can then be given to nuclei or to hives requiring requeening. In the latter case, destroy the old queen forty-eight hours before a queen cell in a protector is given the hive. When giving a hive a queen cell, push the frames in the centre of the hive apart enough to allow the queen protector to go between them. These protectors are so constructed that the bees cannot destroy the cell, at the same time they allow the young queen to crawl out into the hive as soon as she hatches.

To form nuclei for the young queens not required for requeening or other purposes, give the queenless colony rearing, according to the first method given here (as soon as the cells are sealed), as many frames of hatching brood as they can take care of, so as to make them a powerful colony; two days before the queen cells should hatch, a cell should be transferred to each comb by pushing the base firmly into the wax, which saves cutting holes into the comb and making them unsightly. Next day each frame with bees on it, having a cell fixed as above, can be placed in a nucleus and put on the new stand that it is intended to occupy. Give each nucleus a frame of honey and brood from another hive, taking care first to remove every bee. Now, from any hive take a frame of brood and one of honey, shake all the bees off, and give the two frames to the now combless hive that raised the queen cells, fasten a queen cell (which should have been reserved for the purpose) to the comb, and leave it to be taken care of by the bees that were out working when the colony was broken up into nuclei. In this way quite a number of nuclei can be made from one colony, and it is only necessary to keep the entrances of the newly made nuclei closed for twenty-four hours, until the young queens hatch, when placed on the new stand, as the bees will stay with the queen of their own raising. In moving these frames with queen cells attached, care must be taken not to shake or jar them in any way, or the young queen may be injured. Almost any queenless colony will accept a virgin queen that has been out of the cell for not more than twenty-four hours, but after they are three or four days old it is not such an easy matter; but it can be done if time is not of great importance. Into a Miller introducing cage put one of the old virgin queens, plug the hole up with candy, and tack over the hole a piece of cardboard; the bees will gnaw away at the cardboard, and then eat out the candy, all of which will take about five days. This length of time will usually cause the bees to be favourably disposed towards the virgin queen, and she will be fertilised in due course.

To introduce queens coming from a distance, take a piece of fine wire gauze about 5 inches by 9 inches, bend over about ¾-inch all round, so as to make it into a sort of box, unravel the edges of the box for about halfway. The box is now ready for use. Now, proceed to the hive whose queen is to be superseded, and, after removing her, examine the combs until one is found containing hatching brood and honey. Remove all the bees off this frame, and take it into the work-room. Take the recently arrived queen, clip her wing, and let her loose on the frame of brood, having destroyed all the bees that accompanied her. As soon as she starts to eat honey, place the gauze box over and press it firmly down into the comb, enclosing at the same time some honey and as many hatching bees as possible. These young bees, never having known any other queen, take to her at once, and form her escort. The frame can then be returned to the hive, and the queen be released in about twenty-four hours, but should the bees not receive her well, it may be necessary to cage her for another twenty-four hours. If left caged longer than forty-eight hours the bees usually eat a hole to enable her to get out. I have introduced many queens by this method, and have never lost one.

I do not claim for my paper that much of it is original matter, rather have my efforts been to gather the writings and experience of those of greater experience than myself into a condensed form. At the same time, I may state that most of the methods advocated here I have proved by experience to be successful. Should this paper be the means of instructing the novice, and may

be others who have not the opportunity of consulting the best-known authorities on this all-important subject to the bee-keeper, I shall be quite satisfied. We have one present whose experience in scientific queen-rearing is second to none in Australia, I refer to Mr. H. L. Jones, President of the Queensland Bee-keepers' Association. He will doubtless point out to you any points in which his experience differs from mine.

In the meantime, gentlemen, leaving my paper in your hands for discussion, I can only say that the motto of every true bee-keeper should be "*Meliora spero.*"

Mr. H. L. JONES, of Goodna, then introduced the subject of—

THE EXPORTATION OF HONEY.

Mr. JONES: Mr. Clarkson has treated pretty fully the subject of queen-rearing, although there are a few points on which I do not agree with him. They are chiefly, however, minor matters, and as the discussion on them would as likely as not be Greek to many of the delegates, I will not now mention them. I would, however, like to refer to one thing that he has omitted, and that is, in regard to the drone. We heard yesterday of the importance of the male in a dairying herd, and the same importance attaches to the male in the bee industry. It will be useless exercising special care in raising queens if you do not use the same circumspection with regard to the drones. It is a matter that the bee-keeper has practically under control, and he should do his best in that direction. There is one thing about the queen bee which will show the complicated nature of the science of apiculture. The queen bee has the power of determining the sex of her own offspring, and she can lay male or female eggs at pleasure. That shows what we have to contend against, and, altogether, we have a good deal of difficulty in the way of the mating of our queens. As time is, however, short, I shall confine the balance of my remarks to the question of the exportation of honey. Queensland has been endowed with a profusion of honey-producing plants that make it one of the finest honey countries in the world. The climate, moreover, is peculiarly suited to bees. Our native trees produce honey in such abundance that millions of pounds of honey are annually going to waste here simply for the want of an export market. Honey is sold in England at from 6d. to 1s. per lb., and we have to sell it here at 2d. per lb. The first difficulty we have to contend against is the eucalyptus lie. As a matter of fact, there is not a single tree that produces honey that has the slightest trace of eucalyptus flavour. Honey has been sent to England for medicinal purposes that had eucalyptus added to it. Those few shipments have spoilt our trade for the present, and until we can overcome the idiotic prejudice that has arisen in connection with Australian honey on the English market we shall continue to suffer from it. We had in Queensland recently a very large dealer of honey in England—Mr. Morton, of pickles fame. He had been in the habit of buying tons of Californian honey, but on our submitting samples to him he wrote to his firm that he could get the honey he required here. He said he would prefer to deal with us, because we took his pickles, and the Californians did not. Our honey is really worth from £28 to £45 and up to £100 per ton, and, if we could get the first-mentioned prices, we would produce millions of pounds of honey every year. It is being produced, as a matter of fact, but it is going to waste. The Californians have introduced the blue gum into that part of America, and yet their honey is never accused of having a eucalyptus flavour. They see, however, that such a silly fad does not once get started in their markets. We, however, have had no supervision over the honey exported, either at this end or at the other. What we do want at the other end is, representation to see that our honey is properly placed on the market. We know our honey is sold at £17 a ton, and we may safely assume that it is retailed at perhaps £45 per ton. We want, again, proper supervision at this end, and I do not see how it is going to be done unless it is through the Agricultural Department. We want to see no honey shipped unless it comes up to a certain standard. It would hardly pay bee-keepers to send

anything but pure honey, but dealers might export an adulterated or an inferior article. By the new Dairy Act butter must come up to a certain standard before it can be exported, and a similar provision should apply with respect to honey. We would then be in a position to create a big market for our produce, without any fear of its being spoiled by careless individuals. Much could be said on this subject, for there is a tremendous amount of honey in the State, and all that is wanted for it is a market.

Mr. W. G. Winnett (Beenleigh) said he undoubtedly had seen honey in Queensland which had peculiar flavours. In one instance, the honey reminded him of the smell of a tea-tree swamp. He could not say much about the eucalyptus flavour, although he had heard of a consignment of honey which had been dosed with eucalyptus oil had been sent to England, and that this had doubtless been one of the causes of the prejudice alluded to by Mr. Jones.

Mr. F. G. Jones (Biggenden): I am interested in this question of honey exportation, because, although I am a dairyman myself, one of my sons is concerned in apiculture. Five years ago I went home, and two of the objects that I had in going were to find out the conditions of the butter market, and also of the honey market. I took samples of honey with me, and submitted them to specialists. The results I got were, that some of the honey was better than other. In short, that the samples I brought varied in value from £28 to £45 a ton. One lot, specially, I was told, was indistinguishable from the best English honey. I ascertained, however, that under the Registration of Trades Mark Act no honey could be sold as English unless it was produced in England, the result being that my honey, which my specialist told me was really equal to the English honey at 8d. per lb., would, as a matter of fact, if placed on the market, probably only fetch 4d. per lb.

The Chairman: Mr. H. L. Jones thinks our Australian honey is being sold as English.

Mr. F. G. Jones: I beg to differ from him, as I have personal knowledge of the facts. It is immaterial whether the flavour of our Queensland honey is a eucalyptus flavour or not, but there is a flavour that the people of England do not like, and they are prepared to pay a higher price for a honey that does not possess it. It is no use saying it is only prejudice. Perhaps it is, but my experience is, if a person pays for a thing, he will buy what he prefers, and it is no use trying to say he will not. After all, there is not much demand in England for honey for table purposes. It is not much seen on the tables. It is used in the winter for colds and coughs, and, altogether, the great demand for it appears to be for medicinal purposes. Manufacturing chemists who make patent medicines, and biscuit-makers are, I believe, the principal consumers of honey in England. What little honey is required for table use at home is supplied by the various country associations.

Mr. B. T. McKay (Maryborough): I have a proposition placed in my hand, which I understood should have been moved by Mr. H. L. Jones. But, as he has not done so, I will move—"That this Conference is of opinion that assistance, like that which has given such an impetus to poultry-raising, should be given by the Agricultural Department to the honey industry (which already is engaging the attention of over a thousand persons in Queensland), by assisting in a trial shipment of honey to England."

While I have great pleasure in supporting the resolution, still, I do not see that the Government require to give very much assistance. It is plainly a matter of using your brains and your common judgment. Many of the statements we hear with respect to the old country are quite erroneous. We do not buy things on brands in England. We buy them on quality. If I took a colonial home to England, I would like to see how they would look at him in an hotel if he asked for House of Commons Whisky, or Bulloch Lade, or Cutler Palmer. They might divide their whiskies there into Scotch or Irish, but that is, as far as I think, you could get an hotel-keeper to go. I remember paying

1s. per lb. for honey in England, and I had to pay that for it simply on account of its eucalyptus flavour. Therefore, some energetic fellow had sent home some honey flavoured with eucalyptus. If any of our shipments of honey to England have really been failures, it has probably been because there was no one at home to attend to them. If I were going to take honey home, I should not think of sending it to London, and yet I think if I were in Great Britain to-morrow I could easily place 40 or 50 tons of honey. But I would go to towns like Manchester or Leeds. I have been told that recent shipments of Queensland honey have been sent to the Agent-General in London. If he did not dispose of them successfully, he did not give the matter the attention he ought to have done. The Agent-General should be a commercial agent, and I agree that that gentleman should have taken a vital interest in such a shipment. I do not say you should send all your honey to Sir Horace Tozer, but I think that, when he was advised of the first few tons, he should have sent one of his men round to try and place the honey, then tell you where he placed it, and hand the future conduct of the business over to you. As for adulteration, it is very easy to detect, but some people have very crude ideas on the subject. I have heard honey accused of being adulterated because of the sugar in it. As a matter of fact, granulation is an absolute proof of the purity of honey. When water is added to honey, the latter will never granulate.

Mr. C. F. M. Fischer (Zillmere): You have heard in the paper that I have already read that I have had some personal experience in the sale of honey, which appears to have been of a similarly disappointing nature to those of a number of other bee-keepers who have tried to find an oversea market. While we know that candied honey cannot very well have been adulterated, I mentioned the fact that my consignment was accused of having been adulterated, on account of the candying; doubtless, as an excuse for the low price that was realised for it. The honey I sent was of the very best quality; it candied, and because it did so, the agents gave the excuse of adulteration for the low price I received. At the same time as my own consignment, there was another shipment from Queensland, which arrived in a liquid form. This was accused of being mixed largely with glucose. As a matter of fact, the candied honey realised slightly more than the liquid, but both were disastrous shipments. I think there is a very big margin between what the shippers here get for their honey in London and what the English consumer has to pay for it, and, if we could get that margin reduced to reasonable limits, there is no doubt that a large trade could be carried on between Queensland and England in honey.

Dr. Macdonald (Geraldton) testified to the valuable properties of honey as an article of human consumption, and mentioned that in Scotland it was customary during the different seasons to shift the bees from one part of the country to another. It was well known that "heather honey" was about the best that could be got in Scotland, and doubtless the change of air which the shifting about of the hives gave had a beneficial effect on the health of the bees. It was on the health of the bees that they would have to rely for the purity of their honey.

Mr. W. T. Bick (Brisbane) had sent honey to his friends in England. They had assured him that it was the best honey they had ever tasted.

Mr. G. A. Ball, of Killarney, considered the "eucalyptus flavour" was all bunkum.

The Chairman: It is strange how green distant hills sometimes appear, and I would ask those who are so anxious to get a footing for their honey upon the English market, how often they have seen honey coming up the coast, at their hotels, or in the shop windows of the towns they have stopped at? To my mind we have not yet popularised the use of honey in Queensland to the extent we might have done. It is the rarest thing in the world (and I travel a good deal about in the South of Queensland) to see honey in an hotel or private house. I am told honey is one of the healthiest things a person can take. It is

certainly a pleasant one, and yet it is not being consumed. We are told that 3d. per pound will pay, and I am sure a pound of honey will go much further than a pound of jam, for the simple reason that a child, or an adult, cannot consume at one time as much honey as he can jam. Here we have many people interested in the production of honey; the honey is not being consumed here, and we are trying to force it on to the people of Great Britain. Our bee-keepers have spent a lot of energy in trying to get their honey oversea, but do not seem to have devoted the time and work they might have, to creating and forcing their way into the market at their very doors. Honey, as before stated, is a healthy and palatable food, yet how few shop-keepers have it. If they have it, they do not push its sale. We have heard the extraordinary statement that honey was worth in England from £28 to £100 per ton. All I can say is that, if I were a honey man, I would take the first ship I could for England and get that £100 a ton for myself. Some months ago I communicated with the Agent-General, and he obtained for me information from the Board of Trade as to the quantity of honey imported into England. I cannot remember the exact figures, but I was astonished at the comparatively low quantity of honey that was imported into England. He furnished me with the average prices for imported honey, and the figures were obtained through the Board of Trade. It was exactly £28 and a few pence per ton. I am quite prepared to think that the honey that we have so far sent home may not have got into the right channels. I learned from Mr. Morton when he was here (because I make it my business to get all the information I can that will be likely to be of any assistance to our producers) that the firm who handled the last consignment of Queensland honey were brokers who dealt chiefly with drugs. Mr. Morton said that druggists might go to that particular firm for their supplies of honey, but it was a quarter in which he would never have looked for his honey. We have been told the middleman has been getting all the fat. If I were a producer and knew my honey was worth so much more than I was getting, I certainly should arrange to get my honey handled so that I would get as much for it as my neighbour. If this resolution is carried, I shall be only too pleased to assist in any way I can in stimulating the honey industry and getting the honey home to England, but I do think our apiarists are missing the opportunity at their feet. I have it on good authority you can buy it for 1¼d. per lb., and that in places it is going begging. Why? Because the people are not educated to it, and because those who are producing it are not pushing it into the channels in which it would be consumed. If the honey industry is languishing, you have before you the city of Brisbane, the towns up the coast, and the towns behind you, where you very rarely see honey. Of all the gentlemen here to-day, I dare say there are not half a dozen at whose tables honey appears at anything like frequent intervals.

Mr. H. L. Jones (Goodna) said he knew the amount of honey that was produced in England, and that a tremendous quantity was used there.

Mr. McKay: It is seen on every breakfast table.

Mr Jones agreed with Mr. McKay that granulation was the surest test of the purity of honey. If sugar and water were put into honey, the combination would go sour at once. A bee only lived about six weeks, and, therefore, changing the hives from one part of the country to another could hardly have much effect on the general health of the bees. The bee-keepers of the State had distributed thousands and thousands of pamphlets testifying to the virtues of honey, but they seemed to have had no effect. He had even been trying to sell honey on his trip up the coast on his way to the Conference; but he did not see how they were going to get much better prices for their honey in Queensland. They would have to look out for a better and a more constant market. There was a big margin between Queensland prices and the 6d. per lb. and more that honey realised in England. Mr. Jones had paid 10d. per lb. wholesale for samples of honey he had got from England.

IMPROVEMENTS IN PLANTS.

[By EDWARD GRIMLEY, Secretary, Queensland Acclimatisation Society.]

I have already had the honour of reading two papers bearing on this subject—one in 1899, on "Improvement of Sugar-cane Varieties," and the other on "Cotton" in 1900. In the one I illustrated how the process of selection had produced such marvellous results in beet sugar, and pointed out that the percentage of sugar had been raised from 6 per cent. to 18 per cent., thus building up a trade of over £50,000,000 per annum. I further endeavoured to show that, by adopting the same principle of "selection," it was possible to increase the sucrose contents of the sugar-cane to such a degree that beet would be forced out of the market. In the other paper on "Cotton" my efforts were directed to show that, if we Queenslanders desire to grow cotton, we must, by selection or cross-fertilisation, evolve a cotton suited to our climate—a cotton which by its merits would command a relatively high price, and which would be payable even in the present times of low prices.

There are two main modes of improving plants—namely, by "Selection" and "Hybridisation." It will now be my endeavour to show how these principles can be applied to all the crops we raise.

Perhaps it will be well here to describe what is meant by the improvement of plants by "Selection" and "Hybridisation."

SELECTION.

That like produces like is a very old and true axiom, but it is equally true that all plants differ one from the other; even among plants of the same variety there is some slight difference, and even as a shepherd knows his sheep, so can a grower with brains see the difference in his plants—some may be vigorous, others weak; some may be tall-growing, others dwarf; some may be inclined to branch, others not; some may mature early, some late. In cereals, some may give a large ear, others small; some may be disease or pest resistant, whilst others easily succumb. In sugar-cane, the sucrose contents in some plants may be high, in others it may be low. In fruit trees some may be luscious, others tart; the variations are endless, and it is by taking advantage of these variations that a practice has been evolved called "Selection." All these tendencies may be increased by the selection of the seeds through successive generations, and it is by sowing seeds from only those plants which possess the desired features in the greatest degree that the features may be increased. In the case of annuals, the desired result is usually quickly realised, the process naturally taking longer in cases where plants take years to mature; and, by successive sowing of selected seed, a strain is evolved and will become fixed. It is necessary to keep up selection to prevent a return to the old form.

The principle of "Selection" has probably been carried out unconsciously for vast ages, having arisen out of an instinct implanted by Nature in man to desire the best. It is evidenced by the apple descended from the crab, the luscious pear, the strawberry, and other fruits. The cabbage now weighs many pounds, the native plant was only two ounces; the carrot was originally only as thick as a lead pencil; native wheat was quite unlike the present grain. How far we are indebted to unconscious selection we do not know, but it is certain that it was not until the end of the last century that the principles of "Selection" were understood and practised; the work of the improvement of plants on recognised lines has only just begun, and probably during this century it will advance by leaps and bounds.

There are many examples of improvement by selection, notably the beet, mainly by Vilmorin, of Paris, to whom a memorial is being erected, many British horticulturists subscribing. Wheat, barley, and oats have been improved by selection, and now the hybridists have taken the work in hand.

In flowers, selection has done wonders; compare the magnificent roses of to-day with the native sorts, or the carnation and chrysanthemum. In floriculture the advance has been more pronounced than in agriculture. Many wealthy people and scientists have taken up the study, and perhaps the world is more indebted to these enthusiasts than is acknowledged; these men have studied the principles regulating "Selection," and agriculturists are now enabled to work on established laws.

HYBRIDISATION AND CROSS-FERTILISATION.

Under the generic term of "crossing" is meant the fertilising by hand of two plants; when two varieties of the same plant are fertilised, the term cross-

fertilisation is commonly used; but when two species of one or two genera are fertilised, it is usually called "Hybridisation." However, these two terms are sometimes interchangeable. In either case the object is to seek an improvement through the resulting seed. The operation of fertilising one flower with another is simple enough, all that is required, as a rule, being two parent plants in such a condition as to enable the operator to convey the pollen of one flower to the stigma of the other; in most cases the process is obvious, but in others a little complicated. However, it is not the object of this paper to go into such details, but to endeavour to show the good results that may follow the practice. Generally speaking, the product is intermediate between the two parents; for instance, you may desire to cross a sugar-cane of high sucrose content with a variety that is disease-resistant. If your cross results in seed, and you obtain a large quantity of seedlings, they will mostly be intermediate between the two parents, but amongst them there will probably be some that will show the good qualities of each, being immune from disease and of high sucrose contents. It is because of these variations that improvement is possible, and, therefore, it is necessary to raise a large number of seedlings, so that you can select the best, and it is obvious that selection is necessary to complete the work of hybridisation.

As a general rule, the offspring of a cross are more robust than the parents, both as to size and in constitution, and are more resistant to disease and pests.

The difference between "Selection" and "Hybridisation" is that, in selection, you add a slight improvement here and a slight improvement there, gradually building up a more perfect plant, whilst in hybridisation, by choosing two suitable parents, you may jump in one bound into the required position, having practically created a new species.

In hybridisation as in selection, the world is indebted to those keen enthusiasts amongst amateurs who have studied the laws in relation to the subject, noticeably orchid-growers; but at the head and front are the trade seed-growers, such as Messrs. Vilmorin, of Paris, and Messrs. Sutton and Sons and Messrs. Carter, of England, who have studied the principles of "Hybridisation" and "Selection" with some effect. For instance, look at a wholesale seed catalogue, and you will see that petunia seed is quoted at 3s. 9d. per lb., whilst the hybrid and highly-selected sorts are quoted 20s. for $\frac{1}{30}$ of an ounce, or £480 per lb.—surely an incentive to continue the work. It will be my endeavour to show that a high reward awaits the successful hybridiser in agriculture as in floriculture.

At a plant-breeders' conference held in the United States of America some three years ago, it was argued by Luther Burbank that the improvement of plants was of as great influence in the world as steam or electricity. He argued in this way: "The adding of one single grain to an ear of wheat would give 22,000,000 bushels of wheat per annum to the United States of America, and, if the improved variety were common to the world, the increase would be 100,000,000 bushels." When it is remembered that the improvement is not for one year, but for eternity, and the possibilities are that not one grain only, but many grains will be added to the ear, and that the same advance is possible in all agriculture—in oats, barley, potatoes, sugar, maize, &c.—we must admit that his claim is permissible. Luther Burbank stands in the front rank of hybridists, and I see that the Carnegie Institution in California has granted him 100,000 dollars in ten instalments to carry on his investigations in that State, where he enjoys the title of "Wizard of Horticulture."

As it is advisable that all papers read at these conferences should have some practical issue, I shall endeavour to give a list of some of those products that give promise of improvement, in the hope that growers will be stimulated to carry on the work, than which nothing can be more interesting, and which is especially fascinating when new and hitherto unknown forms begin to appear.

Sugar.

As stated, I have written on this subject, but now give a few lines to bring things up to date, and show the advances made. In British Guiana, in 1904, the acreage of seedling sugar-cane was 1,882, and the increase of sugar per acre was 31 per cent. over the acreage grown under Bourbon, the standard variety. It may not be out of place here to mention that one of the seedling canes imported by the Queensland Acclimatisation Society, named B. 208, and since distributed, has given exceptionally good returns. We have now a report from Messrs. Gibson, of Bingera, which gives a return of 69 tons 6 cwt. of cane to the acre, with 22.2 per cent. of sucrose and Brix 23.9, or 21.45 per cent. of possible obtainable cane-sugar or over 14 tons to the acre. These results were obtained under

irrigation, and the experimental plot was well manured. The average cane in Queensland per acre for the last seven years was 13.16 tons, so that B. 208 gave more sugar per acre than the average tons of cane per acre in Queensland.

Sufficient is said to show that an advance is being made; at all events, enough to show that in time we shall get a 20 per cent. cane with fair weight to the acre. Such a cane would drive beet sugar out of cultivation, unless protected by high duties.

Mr. James Mitchell, the overseer of the Queensland Acclimatisation Society, has lately given attention to the hybridisation of sugar-canes, and claims that he has a few hybridised plants from which he expects great results. This is the first effort made by anyone to hybridise sugar-cane by hand. The society I represent can fairly claim, with the Colonial Sugar Refining Company, to be in the front rank of Australia in trying to improve sugar-cane.

COTTON.

Referring to my paper on cotton, read at the agricultural conference in 1900, I may say that I then expressed the opinion that the high prices ruling were liable to a slump. That has taken place, and at present prices it would not pay to grow cotton in Queensland for export to England, although possibly a better market might be found nearer home for limited quantities. To compete in the world's market we must evolve a variety that will always fetch about 6d. per lb., with not less than 300 lb. of lint to the acre. That this can be done is nearly certain, as, by selecting seed from the best sorts, a staple can be fixed which will fetch that price. At the last exhibition in August, 1904, samples were shown, grown in many parts of Queensland, which were worth 6d., or even more, in the present state of the market. In the United States of America the average weight of lint per acre is 180 lb., but some growers, by selecting varieties giving large yields, have raised up to 800 lb. of lint to the acre. If we could get 500 lb. to the acre at 4d. per lb., it would equal 300 lb. at 6d. per lb. That the average return of lint per acre can be raised to considerably higher than 300 lb. is fairly certain. The Department of Agriculture in the United States of America calculate that the average crop of 11,000,000 bales can be duplicated by improved culture, and, above all, by the selection of seed from heavy-yielding plants.

The work of the improvement of cotton in the direction indicated has been undertaken by the Queensland Acclimatisation Society, but, unfortunately, the seasons have been unpropitious. However, a step forward has been made, and I have no doubt the council will persevere.

MAIZE.

The average return of maize per acre for the last ten years in Queensland has been 18.2 bushels, and there should, with good seasons, be four times that amount. If every stalk grew from a well-developed kernel from a good seed-ear, and had its requisite space in each row, the stalks standing 18 inches apart in rows $3\frac{1}{2}$ feet wide, there would be 8,297 stalks to the acre, and if each stalk produced its full quota of seed—which should be 1 lb. to each ear—the yield would be 147 bushels to the acre. This implies good cultivation, "selected" seed, and a fair season.

These figures show that there is ample room for improvement in maize, and "selection" seems to be the mode of improvement rather than hybridisation. The points to be considered are: First, good healthy stalks, showing a good constitution, and the elimination in the experimental plot of any plants not up to the standard. This is necessary, as maize, being a wind-pollinated plant, is liable to receive the pollen from neighbouring inferior varieties; there should be no other maize growing nearer than a quarter of a mile, as maize pollen will carry that distance. In choosing stalks to bear seed, choose those having strong roots, especially those showing strong roots above the surface of the ground. The stalks should have great circumference near the ground, should taper gradually to the tassel, have vigorous foliage—free from disease—and should bear ears at a convenient height. Having only well-chosen stalks, the points to be considered in choosing for a crop are: High percentage of shelled corn to the cob, evenness of cob, uniformity in size and shape of ears, purity of colour in grain and cob, grains well filled out at butt and tips, good size of cob, and equal maturing of cob. The kernels should be of good length, gradually broadening from point of attachment on the cob to the cap. In the United States of America properly grown and selected seed will give, at a moderate computation, 15 bushels more per acre than the unselected seed of the same variety, which seed corn has a monetary value of 27 dollars per bushel.

I may here say that I have heard of people who have imported well-selected seed from the States getting a fair crop the first year, but that each year there has been a decline in the crop, and they have come to the conclusion that the seed had run out. It certainly would do so if the seed were not carefully selected each year, taking the same trouble to select as originally. If this were done, and not too much taken out of the ground without replacement, there would not be any disappointment, as the increased trouble of selection bears a very small proportion to the added value of the crop of highly-selected seed. These remarks apply to all selected seed, whether maize, cotton, wheat, or any other improved plant.

WHEAT.

Wheat lies somewhat outside the scope of the society I represent, the coastal country being unfit for successfully growing that cereal. However, judging by the principle regulating the improvement of other plants, there seems good reason to believe that the wheat crops of Queensland can be improved, and that we can evolve a variety suitable to our climate. I believe I am right in stating that the Department of Agriculture, with commendable zeal, have imported and grown a large number of varieties, with a view to ascertaining which varieties are best suited to our climate, but the mere collection of varieties is merely preliminary work, and can only be reckoned as a means to an end. Having ascertained which varieties, taking all things into consideration, are likely to suit our requirements, then the principle of "selection" comes in. To effect any improvement it is necessary to study and select individual plants, and sow only the seed of those showing the desirable attributes. If an early-maturing variety is wanted in an experimental plot, some plants in the one variety will mature before the others, and by saving the seed of the early-maturing plants and sowing the earliest-collected seed for successive years, a very early maturing variety will be evolved. Some plants will show larger ears than others, and by the same process a variety can be selected giving 4 to 5 bushels extra per acre, as has been done in the United States of America. By examination of a field of rusted wheat, you will probably find some plants that are free from that *bête noir*; or, at any rate, some will be less affected than others, and by sowing the immune seed—or comparatively immune seed—you may create a rust-proof wheat. It is by this means, rather than by trying to import a rust-proof wheat, that success may be attained.

I would here like to bear tribute to the very successful work of Mr. W. Farrar, of New South Wales, who is engaged in the hybridisation of wheat.

POTATOES.

Some years ago Mr. W. H. Parker, of "Glen Retreat," Enoggera, suggested that it would be a desirable thing to have a potato well suited to our climate. This matter the Queensland Acclimatisation Society have not taken in hand, but in writing this paper it suggested itself, and I thought I would touch on the subject, in the hope that someone might take it up. At the present time nearly all, if not all, the seed potatoes are imported from the southern States, and even then they do not give very large crops.

It is not often that potatoes seed in this climate, probably showing that they are not thoroughly at home, but sometimes they do seed. Now and then the climatic conditions may be favourable, and plenty of seed obtainable. By sowing this seed and raising a large number of plants, a variety suited to Queensland, or a portion of Queensland, may be found. The grower may not be rewarded with the huge sums lately obtained in England for supposed disease-immune plants, still he may look for a fair reward for his labours.

Lately a new variety of Solanum, named Commersoni, has been imported into France, and is well spoken of. The tubers are large, and the crop has reached as high as 39 tons to the acre in an experimental plot. The plant was brought from Uruguay. There seem to be possibilities here in hybridisation, and the Queensland Acclimatisation Society has taken steps to secure some tubers of this variety.

FRUIT TREES.

Vines.

The late Dr. John Bancroft was enthusiastic in endeavouring to improve the vines. His object was to secure a hybrid between the European and the American variety, in the hope of obtaining a result that would be phylloxera-proof. He obtained the cross some little time before his death, but the fruit was rather small and tart. He had looked forward to improvement by further crossing and

selecting, which work the Queensland Acclimatisation Society has now in hand, and hopes to bring to a successful issue.

In the United States of America the imported European varieties were a comparative failure, and it was only when they were crossed with the native American varieties that success was obtained, and they have now splendid sorts suitable for the table and wine-making.

Peach.

The late Mr. A. J. Hockings made great advances in the improvement in the peach, but that improvement has not been sustained. It is hardly possible now to buy good peaches in Brisbane; and this result has probably been brought about by the ravages of the fruit fly, making it impossible to grow peaches profitably. In addition to the probability of creating new varieties by selection and hybridisation, it might be possible to obtain sorts which ripen before the fruit fly is about. I am told by Mr. J. A. Allen, of Red Hill, Brisbane, that he has a tree, the fruit of which ripens in the second week in August, and that it is only at the fag-end of his crop that his fruit is attacked by the fly. In this direction it might be possible to evade the fruit fly.

Raspberries.

Some years since our esteemed Government Botanist suggested that the native raspberry might be crossed with the English variety; the Queensland Acclimatisation Society took the matter in hand, and Mr. Mitchell, the overseer, effected a cross and had many seedlings, but, unfortunately, they succumbed during the late heavy drought. Happily another batch of seedlings has been raised, and the result is looked forward to with interest. If we can get the flavour of the English raspberry along with the productiveness of our native sorts, a great deal will be gained.

Whether anything could be done by selecting fruits of our native sorts that are better flavoured than others, remains to be proved. Certainly at Cairns some have been found of much better flavour than those in the South, but that may be merely climatic.

Strawberries.

The great want of this fruit in Queensland is flavour. There are a good many persons now raising seedlings, some of which are superior in flavour to those generally grown. The climate is perfectly suited to the growth of this favourite fruit, and there is not much doubt that we shall ultimately obtain varieties well-flavoured, as has been done in Florida (U.S.A.), where the climate very much resembles ours.

Pineapples.

Some attention has been paid to the improvement of this luscious fruit; the Queensland Acclimatisation Society has this matter in hand, and hopes are entertained that, by selection from the large number of seedlings raised, improved fruit may result and immunity from disease secured.

Passion Fruit.

There is ample room for the improvement of this fruit in flavour and size by selection.

Mangoes.

Without a doubt great scope for improvement lies in this fruit. Knowing the quality that is possible, it seems strange that we cannot buy palatable fruit in Brisbane. Containing as it does fruit "fit for the gods," it is remarkable that wretched, flavourless fruit, full of fibre, should be placed on the Brisbane market. There is slight excuse for this state of things now that the grafting of the mango is so successfully accomplished. It is possible, by selecting seed, to improve the mango wonderfully. Mr. W. H. Parker, of Glen Retreat, Enoggera, Brisbane, has raised many score of seedlings, and his experience is that most of them are equal to the parent, and many greatly superior. If we are to supply Australia with mangoes, we must evolve a variety with good flavour, free from fibre, and a good shipping sort.

Native Fruits.

Many of our native fruits are well worthy of development and improvement. For instance, there is Meston's mangosteen, the Davidsonian plum, or the Queensland nut, of which trees with comparatively soft shells are to be found. By "selection," probably a sort with quite soft shells will result.

In conclusion, I would point out that improvement in plants must go hand in hand with high culture. It is no use to improve without the culture brings out the best results in the plants. Good culture alone applied to unselected plants cannot give such satisfactory results as when highly-selected plants are grown. For instance, high culture is thrown away on a sugar-cane that only gives 1 ton of sugar to 8 tons of cane when one can be cultivated which will give 1 ton of sugar to 5 or 6 tons of cane. Likewise it is useless to grow a cotton which gives a return of 300 lb. of lint to the acre when a variety giving up to 800 lb. can be obtained by selection of seed.

I am aware that this paper is lacking in many details which might be of assistance to growers. It is, however, intended to be suggestive rather than exhaustive, and if it serves to stimulate anyone in the improvement of plants—and I take it there is no nobler nor higher work—I shall be satisfied, and my object shall have been attained.

It is only fair that I should say that I am indebted to the "Year Book of Agriculture," published by the Department of Agriculture in the United States of America, for much of the information contained in this paper.

The Chairman: We have listened with very deep interest to a highly instructive and interesting paper. I do not known whether it is desired to discuss it or ask any questions with respect to the points raised by Mr. Grimley. If there are any questions or suggestions, I would ask that they be made promptly, as we are now getting limited to time.

Mr. A. Rickert (Allora) said that most of the plants that had been referred to did not grow in his district, and, as a consequence, he would not dwell upon them. He had, however, been a wheat-grower for thirty years, and if he had had the wheats at his command thirty years ago that he had now, he would be a much better off man to-day. He wished to take the opportunity of thanking the Agricultural Department for the work it had done in placing at the disposal of the farmers on the Downs varieties of wheat suited to their requirements. He agreed with Mr. Grimley in his remarks dealing with the importance of the selection of seed, and he desired to impress upon wheat-growers the importance of exercising care in the selection of the seed they planted on their lands. They would sometimes hear it stated that such and such a variety was a good wheat once, but that it was no good now. Mr. Rickert, however, questioned whether there was really such a thing as a wheat running out. The real cause of the apparent deterioration in a variety was the sowing of mongrel seed. When Mr. Rickert intended to plant land with seed of a wheat he approved of, he selected every ear by going through his crop with a bag at his side, into which he placed the best-developed ears he could find. The seed from these ears he would sow the year following, and make another selection from the resultant crop. By doing that, he never found that his seed "ran out." He did the same with potatoes, and thought the same principle applied to all the crops that a farmer grew.

Mr. D. Pearson (Halifax) testified to the good work that had been achieved by the Acclimatisation Society in the matter of the development of new varieties. As a member of that society, he had been accorded the privilege of getting some very good new varieties of sugar-cane from the Acclimatisation Gardens, and one of the varieties mentioned by Mr. Grimley gave every promise of being an acquisition to the canes now grown in the State. Mr. Grimley had presented the subject in its right aspects, and the production of 14 tons of sugar per acre instead of 14 tons of cane would certainly influence the labour market considerably.

Mr. W. T. Bick (Brisbane) alluded to the fascination of cross fertilisation. There were dozens who were now engaged in this useful work, and the speaker had seen some dahlias at a late show in Brisbane concerning which a gentleman from England had assured him he had never seen the like. These dahlias had been produced in Brisbane. With their climate there was no end to the improvements that could be effected in plants, provided people would only take the matter up. If any delegate was in Brisbane on the second Wednesday in

any month, the members of the Horticultural Society, which Mr. Bick was representing, would be only too pleased to see him at their usual monthly meeting on that evening.

Mr. J. M. HUNTER (Roma) said that Mr. Grimley's paper dealt with one phase of hybridising and selection which he (Mr. Hunter) had been concerned in for a number of years. He was very pleased to hear that some of the farmers had undertaken experiments in the selection of grain on their own account, for it was a field in which there was great scope for experimenting. In Queensland a good deal of the failure that had so far been experienced in many parts to produce a good and rust-resistant wheat was due to the fact that they had no standard varieties. Something between twenty and twenty-five varieties were grown in the various districts, and, with the exception of a few of them, there were none of them worth wasting time over. Varieties should be secured for the farmer, which would give large returns, and which, later, would catch the eye of the buyer when they had to export. During the Conference he had noticed with a good deal of interest how united the fruitmen, dairymen, and sugar-planters along the coast were in comparison with the cereal-growers on the Downs and in the Western districts. Many of the cereal-growers were separated from each other by long distances, but he thought they should take more action to see that their industry received more attention than it did. At present, their interests were seldom spoken of, and consequently considered, in the main centres of population. Many of them were growing the same class of wheat on the same sort of soil without changing the seed or making any attempt to select, for seed purposes, the best grain that was produced in their fields. Even a little combination and spirit or co-operation would do a great deal towards removing such apathy as that.

Mr. W. DEACON (Allora) asked whether he was correct in understanding Mr. Hunter to say that they did not have a good wheat in Queensland?

Mr. HUNTER said that, with the exception of two or three, there were no standard wheats in Queensland.

Mr. DEACON said, if they could only get two or three standard wheats, it would be better if they had to go in for exporting. A shipment of one kind of wheat would be more successful than a shipment containing half a dozen different sorts. He was greatly obliged to Mr. Grimley for his paper. Its only fault was that it was a bit too long, and Mr. Deacon's experience was that at Agricultural Conferences they could not digest more than three pages of print at a time. He thought, however, that the Acclimatisation Society might do more than it was doing, and he was afraid that it had perhaps got a little sleepy. The society ought to be as valuable to them as the Agricultural Department. There were two methods of improving their wheat. The first was hybridisation, which, although not particularly difficult, was intricate and took a long time to show definite results. For those reasons he would not commend it to every farmer. There was nothing, however, to stop anyone from seeing the value of selection and going in for it. One big factor in wheat production was the number of grains in an ear, yet how few farmers ever counted the grains in an ear of wheat. Last year, however, he found more grains in an ear than in any previous year that he could recollect. He counted over seventy in one ear, although he knew that was by no means a record. What they wanted to do was to increase the size of the grains and their number, and towards attaining that end selection would assist them. One gentleman in England, who had been very successful in improving wheat, had relied solely on selection. His principle was, that in every sheaf of wheat there was one ear better than all the rest, and that in that ear there was one grain better than the others. His idea, then, was to get that grain. Mr. Deacon had seen a photograph of that gentleman's wheatfield, and he had to say that he had never seen photographs of such giant heads in his life. He hoped the time would not be far distant when there would be as much attention bestowed in improving

the plants of the field, as there had been in improving the flowers in their gardens and the fruit trees in their orchards.

The CHAIRMAN said the next matter for their consideration would be coffee. It would be introduced by Mr. Burnett, of the Maroochy Pastoral and Agricultural Society. Mr. R. W. Warren, of Cairns, would also contribute a paper, and Mr. Howard Newport, the Instructor in Tropical Agriculture, would be asked to give a few remarks on the subject, and state what had been done by the Department to handle the coming coffee crop in North Queensland. After coffee had been dealt with, there were two papers on land settlement, the discussion on which would practically conclude the Conference.

The next paper was—

COFFEE-GROWING IN SOUTHERN QUEENSLAND.

[By W. W. BURNETT, Buderim Mountain.]

In Southern Queensland coffee-growing has not received the same amount of attention that has been bestowed upon it in the Northern portion of the State. There are only two places that I know of south of Bundaberg where coffee is grown as a commercial crop—viz., Pialba, near Maryborough, and Buderim Mountain, where I come from. The reason that coffee has not gone ahead with us is not the want of suitable land and climate, for we have hundreds of acres of good, deep, volcanic lands on the eastern slopes of the Blackall Range—Dulong, Mapleton, and many other lcoalities—nicely facing the warm morning sun and the Pacific Ocean, and also entirely free from frost. The causes why coffee has not been popular with our farmers are—the nearness of good markets for quick-producing crops, sugar-cane growing, and the good prices hitherto realised for fruits such as bananas, oranges, pineapples, &c. These factors have all militated against the recognition of coffee as a profitable crop to grow. But a change in the fruit industry has taken place. The Chinese fruit-producers of Northern Queensland have well nigh ruined the fruit industry as far as the white growers of Southern Queensland are concerned, and therefore it will become necessary for them to turn their attention to some other crop; and I consider that coffee will be, in a great many localities, in the district between Caboolture and Gympie, the crop for the farmers to go in for, as an adjunct to other crops. Coffee was introduced to Buderim Mountain some thirty years ago by Messrs. Dixon and Ridley, the pioneer settlers of Buderim, who obtained about half a dozen plants from the Brisbane Botanic Gardens. The plants grew splendidly, and produced a profusion of fine berries; but sugar was all the rage then, so coffee became neglected, and it was not until about fifteen years ago that the farmers on Buderim turned their attention to coffee-production along with their fruit culture. Now, almost every grower has his patch of coffee, and finds it useful in bringing in a very convenient cheque, and thus helps materially to make the orchards profitable.

COFFEE IN SMALL AREAS.

I consider that coffee-growing in Southern Queensland will never be carried on, in very large areas, or on the same scale that obtains in such countries as Brazil, Ceylon, and other places, but will be cultivated in small areas, along with other crops. In fact, I look upon coffee as the family crop, to be worked and harvested by the grower's family, with the help, perhaps, during the picking season, of other children obtained in the neighbourhood. The labour conditions of Southern Queensland prevent any possibility of coffee being grown in extensive areas. But there is no reason why large quantities of coffee cannot be produced, and profitably produced, by farmers and orchardists cultivating areas of from 1 to 10 acres each, and thus adding materially to their own and the country's prosperity. On Buderim, where the largest area any one possesses does not exceed 5 acres, there were produced last season 12 tons of first-class coffee, realising 5½d. per lb., which meant a very nice sum in the aggregate for Buderim. And there are many other localities in Southern Queensland that could do likewise.

MORE ENCOURAGEMENT AND PROTECTION NEEDED.

More encouragement and protection are needed to place the coffee industry in a sound and flourishing condition. According to statistics, it requires about 2,500,000 lb. of coffee to supply the wants of the Commonwealth. That would

show that there is a good market for many years to come for all the coffee Queensland could produce, and that there should be no trouble on the part of the growers to get rid of their coffee at payable prices. But, unfortunately, such is not the case. We are entirely in the hands of a combination of manufacturers, who allege that they can import coffee cheaper than they buy it from Queensland growers. The Brisbane manufacturers acknowledge that Queensland coffee is very much superior to imported; in fact, Mr. Thurlow informed the late Minister for Agriculture (Mr. Dalrymple), when he opened our local show at Woombye in 1903, that the coffee grown in the Woombye district was the finest in the world, and yet he could not see his way to offer more than 5d. per lb. for it. Surely there must be something wrong about importing coffee cheaper than buying it in Queensland, for the manufacturers must pay 3d. per lb. duty on landing, which leaves only 2d. or less to buy the coffee at first hand, and pay shipping freights and other charges. I certainly consider it impossible, and that the manufacturers are simply using the statement so that they may get our coffee at their own figure. If they are buying the imported coffee at 2d. per lb. or less, then it must be an extremely low-grade coffee, and, I should fancy, not fit to go into consumption. We coffee-growers of Buderim Mountain consider that if we but obtained 6d. per lb. for our coffee, and that price to be the minimum, the coffee industry would be a good paying one, and would soon extend into a big and flourishing business. The prices now offered—viz., 5d. to 5¾d., with an allowance of 2½ per cent. for waste—while they may be termed payable, still leave no margin for future extension, while another penny would be the means of allowing the growers to extend their areas with advantage. I consider that before the growers will be able to meet the manufacturers or buyers on equal terms, and be in a better position to demand just prices for their coffee, they will have to combine and form some kind of coffee exchange, say, in Brisbane, so that all the coffee grown in Queensland can be sold through one agency, by sample; none but growers to be members; a minimum price to be fixed annually. Such an exchange would be a boon alike to buyers and growers. It would prevent the growers being taken singly and thus squeezed by the buyer, and the buyers would know where to go to buy their coffee in bulk, &c. I think the coffee exchange scheme should receive every consideration by the growers. The Federal Government should also raise the duty again to 4d. per lb., which would materially help the industry, and give a stimulus to coffee-growing, and would, I believe, prevent a lot of low-grade coffee from being imported. The extra penny would not materially affect the price of the manufactured article, or appreciably hurt the pockets of the consumer. Even if it did raise the price slightly, I think the benefit arising from the coffee industry, by establishing factories and plantations, would more than cover the slight increase of taxation on imported coffee. I wish also to draw attention to our railway freights on coffee. Our station, Woombye, is 62 miles from Brisbane, and we Buderim growers have to pay 17s. 2d. per ton on parchment coffee, and if we send a ½-ton lot we pay 14s. 2d., or at the rate of 28s. 4d. per ton. A ton of maize or a ton of potatoes costs 9s. 10d., a difference of 84 per cent. on the ton, and 120 per cent. on the ½-ton lots. Now, there is no difference to the Railway Department in the handling or responsibility of the two commodities, maize and coffee. So what reason can be given for the difference in freight between the two commodities? I was told it must be that coffee was a more valuable commodity than maize, therfore could stand a higher freight. If that is the principle the Railway Department works on, they should carry that principle right throughout the service, and charge a millionaire a higher price for a first-class ticket than a poor coffee-grower. Now, coffee in parchment is only raw coffee, going to the factories to be manufactured into a consumable article, the same as maize may be going to a factory to be made into maizena or maize-meal, and therefore should not be treated differently with regard to railway freights. I trust our railway authorities will take this matter into consideration, and see their way to encourage the coffee industry by cheaper freights. I do not believe in assisting the coffee industry by means of bonuses, as that system only confers temporary relief. There are three ways by which the industry can be made better, and those are:—

1st.—By combination of coffee-growers, and the establishing of a coffee exchange for the selling of their coffee.

2nd.—The raising of the import duty to 4d. per lb.

3rd.—The lowering of railway freights.

I have reached the end of my paper, and can now only hope that the coffee industry in Queensland will soon expand into a flourishing and prosperous one.

Mr. R. W. Warren, of the Cairns District Coffee-growers' Association, then gave the following address on—

THE EFFECT OF THE COMMONWEALTH TARIFF ON THE COFFEE INDUSTRY, AND THE ASSISTANCE AFFORDED BY THE STATE GOVERNMENT.

[By R. W. Warren.]

This paper treats of the effects of the Commonwealth tariff on the coffee industry in Queensland. Now, Mr. President and gentlemen, as a coffee-grower myself, and looking at the matter from the point of view of the producers, and, therefore, of the industry, I claim your consideration for my contention in these remarks; for the building up of an industry such as this is, to my mind, of paramount importance to the Commonwealth, to the State, and to ourselves as agriculturists.

Regarding the import duty on coffee, it is obvious that the free trade aspect of no duty at all would both prohibit the cultivation, under circumstances in which we are situated in this country, and produce no revenue; and a duty, therefore, is both necessary and advisable.

It would seem, at first glance, that a high duty would be advantageous, by both increasing revenue and the price of the product to the grower, but a high duty would also have a detrimental effect in discouraging consumption by unduly raising the price to the consumer.

Under these circumstances, I am of opinion that the present duty of 3d. per lb. on raw coffee is equitable—that is, it is high enough without being too high; and, therefore, I do not in any way advocate its being increased.

The abolition of the duty on tea has had a very distinctly detrimental effect on the coffee industry, by reducing the consumption of coffee. The industry wants more coffee-drinkers, at the same time as encouragement and protection from the imported article, and I am of opinion that what would effect this and help the grower most would be a *bonus*.

I believe the recent Premiers' Conference was in favour of a bonus on cotton and coffee, and also of reimposing part, if not all, of the duty on tea. In the present state of the revenue this would, to my mind, be a very wise step, especially as all wage-earners having an income of under £100 are exempted from the income tax.

I do not suggest that a large bonus should be granted, and think that 1d. per lb. would not be extortionate, but, at the same time, sufficient to protect the grower from undue competition and to encourage cultivation.

Taking the figures for 1903 (returns for 1904 not being available), the total production of coffee was 83,632 lb. Had the sum mentioned been paid as a bonus, it would, that year, have amounted to only £350, and which, divided up into the population of the Commonwealth (taken as 4,000,000), would represent a taxation of one-fiftieth of 1d. per head, which is so infinitesimal that, should the industry even increase to the extent roughly stated possible by the coffee expert—that is, twenty times as great as at present—it would still be too small to be felt—viz., two-fifths of 1d. or less than ½d. per head per annum.

The bonus prayed for, therefore, cannot be considered excessive, and scarcely be objected to on the score of its cost to the Commonwealth. Should such a bonus be granted, and the industry increased to these proportions, as is indeed probable, any loss of revenue from import duty would be made up by the consumption, by the new settlers and growers of coffee, of other duty-paying goods. Moreover, in this connection the value of the imported coffee must be looked at. The value of the imports, according to Mr. Coghlan's figures, for 1904 are £58,191 (including a small quantity of chicory), which sum, it must be admitted, is worth an effort to keep in the country, and, if so kept, as there is no reason why it should not be, would support a comparatively large community on the land.

Now to compare the taxation represented by the bonus paid on sugar—without going into details—this will be found to work out roughly at 6d., showing a very materially larger and not to be ignored taxation per head of the population.

I find, from figures published by the Minister for Agriculture, that there was a falling off of the amount of coffee produced in 1903 (83,632 lb.) from that produced the previous year (111,301 lb.), but I would like to point out that there was a very severe frost (4 degrees Fahr. two nights running) just at the end of the 1902 season, which seriously affected the 1903 crops by damaging the trees, many

growers having to cut theirs down. The crop that year was, on the ranges here, I think, 25 tons; and while some of the growers saved that season's crop, others lost theirs, I among the number.

In spite of this setback and to show that the growers did not lose heart, I may mention that in 1903, although the crop was less, the area had increased.

If it is necessary to pay so large a bonus to the larger sugar industry—some £100,000 per annum—to eliminate alien labour and keep a White Australia, surely the same argument applies with, if anything, greater force to the smaller industry of coffee-growing which is less able to stand by itself, especially when the amount involved is so small and would be so little felt.

I would wish to impress upon the Conference as well as on the State and Commonwealth Governments that the coffee industry is purely a white labour industry. As far as I can ascertain, there are not half a dozen aliens in any way employed in coffee work, and these can be dispensed with at any time, and being kanakas will naturally go in 1906.

The effect of such a bonus would be to enable the growers at present in the industry to pay for the cost of harvesting, which is in this, as in most agricultural industries, the heaviest portion of the cost of production; to place their product satisfactorily on the southern market, and insure them from loss until the commodity is well established in the open market; also, it would do more to attract settlers and growers of coffee than an increase of duty or any other means, and insure not only the sound estalishment but the rapid expansion of the industry.

In comparison with duty, this system will, I think, be admittedly better, as it would in no way handicap the merchant or increase the price to the consumer. It would not feed the middle-man, but would go directly to the producer himself.

As to whether the Queensland product is worth encouraging and the coffee industry worth fostering, there can be little doubt. According to the report of the Instructor in Coffee Culture on his return from New South Wales and Victoria, the Queensland article was there found to be better in point of flavour, aroma, and liquoring quality than the average coffees of Central America, Brazil, &c., which are those mostly imported, and to be equal to the finest coffees of East India, Ceylon, and Java in everything except liquoring quality. It now stands only about third on the list in point of quality, and may be expected to improve as the plantations get older. It was valued at 9d. (clean). That this price has not been realised is due rather to the fact of its not being well enough known and not being uniformly graded, &c., than to any fault of its quality. The coffee is now beginning to get known on the markets of the Commonwealth, and the price is gradually increasing. Last season I myself was offered 4½d., f.o.b. Cairns, for coffee in parchment by Brisbane buyers, while Sydney buyers offered 5½d. for the same coffee, showing that either the Queensland buyers did not know its value or did not accord it justice. This all goes to show that Queensland coffee is worth fostering, and once established will be able to hold its own.

The methods of cultivation pursued are of a very thorough character—viz., the plough, harrow, and cultivator with horse-power, as against hoe and sickle in countries where coloured labour is used. In the North of Queensland, especially on the Cairns Range, the picking season starts in April and lasts till August or thereabouts. The heaviest picking being in July, which is the coolest time of year, when the thermometer hardly ever goes beyond 80 degrees Fahr. in the middle of the day, and it is much colder in the mornings and evenings. I hope to see, in the future, coffee-pickers come from the cramped surroundings of the towns, and make annual excursions into the country for the principal part of the picking season, in the same manner as the hop-pickers of the old country, and thereby gaining health and strength by a few months of life in the open air.

There is no doubt at all that coffee culture could be conducted with white labour, and if it is, as it seems to be, the desire of the State as well as the Federal Government to encourage industries capable of being worked by white labour, they could not show their *bona fides* more satisfactorily than by supporting coffee culture by a small bonus as asked for.

One special reason besides this fact, however, should carry weight, and that is that the imported coffees that the Queensland product has to compete against are entirely, and in every single instance, grown by coloured labour.

Before the Tariff Commission in Melbourne in March last (10th), a Mr. Crespin, the Australian agent of an East Indian coffee-planter, gave evidence, from the standpoint of the importer, on the tariff as it affects coffee. He contended

that the tariff was too high, but contradicts himself by saying that Queensland cannot successfully compete against the cheap labour conditions of other countries, and that it is worth protecting and should be protected. He was asked to state what wages were paid by his employer, Mr. A. G. Nicholson, of South India, to his employees, and replied that he did not know. We could answer that question for him: the average daily wage of the male field labourer is 4d. to 5d. per day, and that of females and children still less. (This does not include food or rations.) This will show what we in Queensland really have to compete with. Mr. Crespin contends also that the duty tends to cause or encourage adulteration. In this I think he is wrong, for it implies that the benefit of price goes to the consumer, whereas it has been the case that when adulteration is resorted to the profit or most of it was taken by the manufacturer of the inferior article. That there is a good deal of adulteration, and some of the so-called coffees are, in the words of this witness before the Tariff Commission, "a disgrace to the stomach," is a regrettable fact; but the remedy for this lies in the stricter application of the Health Acts or Food and Drugs Acts of the various States rather than in lowering the duty.

To show that the State Government is in practical sympathy with the coffee-growers, there is now in course of erection at the Kamerunga Nursery an up-to-date coffee curing and grading plant, where parchment coffee will be received, in small or large lots, hulled, graded, bagged, and branded for shipment. The Department are going even further and are prepared to place crops on the best possible markets under conditions in which it can compete on a more equal footing than hitherto with the imported graded article. This will prove a great boon, especially to the small growers, and cannot but result in immense benefit to the industry as a whole, not the least of the advantages being the check that will be imposed (by the fact of this inspection and branding by the State) upon the indiscriminate shipments of inferior qualities which this industry has suffered from in a similar manner to the butter industries.

No small measure of praise is due to Mr. Denham, the Minister, and his Under Secretary for inaugurating this scheme, as well as to the Instructor in Coffee Culture, who has been unfailing in his efforts on behalf of the growers, and to which gentlemen the best thanks of the growers are due.

The State having shown by its action that the industry is worth fostering, we look to the State to go a step further and use its influence with the Federal authorities to obtain this bonus for us, thereby preventing any possible nullification of its action by the Federal Government, and insuring a successful issue for the scheme to which the State Government has pledged itself.

Mr. Howard Newport (Instructor in Tropical Agriculture): I am aware that small industries such as coffee and cocoa do not attract as much interest as some of the larger ones, and that they do not appeal to a good many of you. Perhaps half a dozen may be interested in coffee, but the others may not be. But we should all give such industries due credit and attention for several reasons, for the time must come when we will not be able to solely rely upon what we are now growing, but will have to look to other products that we may possibly be able to grow. Some of these subsidiary lines we will doubtless be only too glad to take up later on. But another point why coffee should have attention is, because it is a commodity that we are growing, not with a view to export, but with a view to supplying our own demands in the Commonwealth. We in North Queensland, out of the whole of Australia, are at present the only ones who can produce coffee. That is the point of view of the merchants down south. They seem to lose sight of the matter from the growers' point of view, and consider they have a grievance because, whereas they had no duty to pay previous to federation, yet now they have to pay a duty on their coffee. Some of the gentlemen who gave evidence before the Tariff Commission argued in that strain, forgetting that the lowering of the duty would be absolutely fatal to the coffee-growing industry of Queensland. We have an uphill battle to fight in entering into competition with those countries which grow coffee with cheap labour, and though we hope by improving and modifying our methods of cultivation to leave a greater margin between the cost of production and the price of realisation, until that period arrives we must rely upon the tariff, and this tariff is one that is seriously affected by those people who are nearest to the centre of Government. Those

people know nothing of the coffee-growing industry beyond what they can learn from the opinions we express up here in the North. I am not now speaking to a coffee-growers' meeting, and it is a little difficult for me to avoid going into technicalities that would only interest a few of you. At the same time, however, I am glad of the opportunity of saying to you a few words in connection with this industry. I could start and give you an account of the whole business from the beginning, and it may be of interest to tell you, in connection with the first introduction of coffee into Queensland, that I have been shown, with great solemnity and pomp, the first coffee-tree that was ever grown in Queensland, in at least half a dozen districts. In the drawing up of the programme, the last few papers have been very aptly arranged. Bee-keeping was dealt with a little earlier in the day, and this is one of the cases where the subsidiary products fit in one with another. Perhaps the connection is not very obvious to many of you, but bees have a great deal to do with the fertilisation of coffee, so much so that, where bees are kept, the amount of berries that set is infinitely greater than in plantations where bees have no existence. Coffee would, therefore, derive a benefit by being associated with apiculture, and the bees would have a chance of obtaining a honey in which there was no suspicion of a flavour of eucalyptus. Coffee blossoms about six times a year, and it blossoms exceedingly freely. The sight of a coffee plantation when in flower is well worth witnessing, and the sight of several hundred acres in blossom once seen is to be remembered a lifetime. The perfume is strong, and the plantation is a paradise for bees and similar insects. This is so well recognised in India that the coming of bees at blossoming time is regularly looked for as the omen of the crop that is to be obtained afterwards. The transportation of bees from one part of the country to another has been mentioned. Bee-keepers here may know the large bee of India, which produces an enormous amount of very fine honey. These bees seem to know by instinct that the time of the blossoming is about to arrive. They appear in countless numbers, swarming on the trees, cliffs, and rocks near the coffee estate, and will stay there apparently, especially waiting for the coffee blossoming, for they get away when it is over. Seed selection was very ably dealt with by Mr. Grimley this afternoon, and I may say that, in coffee culture, this matter of the selection of the seed to be used is a most important one. The fact that the coffee-tree, when once planted, is going to be permanent intensifies the necessity for care in the selection of the seed you use for the raising of your young plants. Once the tree is there, it stops there. I would like to mention one thing to those who desire to obtain coffee seed in quantity. Many write to me at the Nursery, asking for seed, and some of them seem to be disappointed because I do not give it to them for nothing. Some of them also seem to be disappointed when I give them the name of a grower from whom they can purchase seed. Seed of good varieties can generally be obtained easily enough not very far from any district where coffee could be grown, and to those who would care to know how to select the seed, and what to do with it, I may say that it will be a pleasure to me to supply them with information in detail if they will only communicate with me. I give you this information because coffee, having now gone through some of the difficulties that are inevitable with a pioneer industry, looks as if it has turned the corner, and was in a fair way towards success, and possibly your constituents, when you return home, might want to know these particulars. If they do not ask for them, it might possibly be worth your while to volunteer the information to them. In both the papers that have been read, the matter of the coffee duty has been touched upon. I do not intend to say much about that, but the fear is, that there is a tendency down south to lower the coffee duty. This, we who are interested in the industry claim, would be fatal. Whether it should be raised, or whether it should stand as it is, and whether the present amount of the duty is the difference between the cost of production in this country and the cost of production in another, is not for me to say. But I think we should not lose sight of the fact that, while we in Queensland had a duty of 4d. per

lb., which has been reduced by the Commonwealth to 3d., we should not think we are under too great a disability, for we should remember that our markets have been quadrupled for us by our having the whole of Australia open to us. We have been apt to lose sight of the fact, and ignore the advantage which has been offered to us. It stands to reason that we should be able to get a better price for our coffee by putting it upon the open market of the Commonwealth than when we only had the Queensland market before us, and had to compete against the world in the markets of the other Australian States. What we are now aiming at is to get an open market for coffee in Australia, or a market where all the buyers will come together, and we will be able, by means of an auction possibly, to dispose of our coffee at the highest possible prices. I think our coffee is more likely to obtain justice in open sale than if disposed of to the private buyer. Coffee, as a subsidiary crop, has some special advantages which are well worth considering. It also has its disadvantages and disabilities, and I might mention the latter first. One of these is the fact that the bulk of the coffee produced in the world is produced in hot countries by cheap labour. The difference in the price of that labour and the rates prevailing here is very great. The difference between 4d. and 6s. per day is tremendous, and when this is realised by the prospective grower, the first thing that enters his mind is, Can I expect to compete with the growers of coffee in other countries under such conditions? There are other conditions which render it possible for such competition to take place, but even then it cannot, for the present, enter into such competition without the assistance and aid of the Government. It is to the Commonwealth Government in particular that we look to have this industry kept alive, and kept alive, not for Queensland, but for the Commonwealth. Among the advantages that the industry has is the fact of the impossibility of so serious a pest as the fruit fly doing any harm to us. The more fruit fly bites the coffee gets the better it is, if anything. The fruit fly does no harm to the coffee, and, if the berries serve as traps for the fruit fly, the plant will be of assistance to the fruit-grower. I may say that the matter of the curing and grading of coffee has been undertaken by the Department on behalf of the coffee-growers, and in this, I think, the Department is according a great boon to the coffee-growers of the State. The reason is briefly explained by the folowing paragraph of the circular which has been issued by the Department:—

"In view of the complaints of coffee-growers that great difficulty has been experienced in satisfactorily disposing of their crops, especially when in small lots, and the statements of the southern buyers that such consignments are of uneven curing, and that all require, and would greatly benefit, by uniform grading, the Department has erected a coffee-grading mill at the Kamerunga State Nursery, Cairns, for the purpose of supplying this want, and assisting the industry. Hulling, winnowing, peaberry separating, and general grading machinery has been obtained from England, and coffee will be received in the dry parchment state, hulled, separated, graded, packed, and despatched south for sale to such markets within the Commonwealth as the Department may ascertain to be most advantageous. The Department cannot receive at present *coffee in the fruit or 'cherry' stage, as wet or undried parchment, or as 'dry cherry,'* and has no intention whatever of roasting, grinding, or retailing coffee, or in any similar manner competing with private enterprise. Growers, desiring to take advantage of the privileges and advantages offered, are invited to notify the manager of the State Nursery, Kamerunga, Cairns, and to send in coffee for treatment and realisation. After hulling and grading, growers may have the option of taking delivery for private sale, if desired, on payment of the costs of the operations, and any expenses that may have been incurred in connection therewith. The coffee to be realised upon will be despatched south, as soon as ready, to such market as the Department may deem to be most advantageous at the time, and on receipt of the proceeds of sales the accounts will be adjusted by the manager;

the actual cost of the operations, together with such other expenses as railages, freights, bag, twine, &c., will be deducted, accounts submitted showing these items, the out-turns of each grade, and the prices obtained, and cheques or drafts for the balance sent to the growers. The coffee will be sold by the brokers or agents under instructions from, and on behalf of, the manager of the Kamerunga Nursery, and no ownership indicated beyond the initials or brands on the bags. While it is anticipated that a considerable improvement in price will be evident on the proper and uniform grading, &c., of the coffee, as well as encouragement afforded the industry by such facilities in satisfactorily placing the crops of growers on the market under favourable conditions, it is to be understood that the Department will not purchase or advance on crops submitted for treatment and sale, and that all operations will be carried out at owner's risk."

The Government will receive coffee from any grower *in the dried parchment state*, will hold it for him, will grade it by the best machinery, and will go further, for it is quite prepared to assist the small grower by putting the coffee on the open market of the Commonwealth. It must be remembered, as above stated, that the Government can only receive the coffee in the dried parchment state. You will be aware that there is always a certain amount of "tailings," but we hope to be able to treat these also in a little while. When we do so we will be able to put in marketable form every coffee-bean that can be collected. One point I would like to draw attention to, and that is, that coffee is now receiving more attention in the North than it is in the South. It is essentially a tropical product, and it is, therefore, reasonable that I should be stationed in the North.

The CHAIRMAN: I think certain aspects of the coffee industry have been put before you by Mr. Newport in a succinct and admirable manner. The subject now before you is the effect of the Commonwealth tariff upon the industry. Oddly enough, both those who have read papers are coffee men, one in the South and the other in the North, but both hold opposite views. Before we come to the question of a resolution, I hope they will arrive at some sort of unanimity. Mr. Burnett asks for an increase of duty, while Mr. Warren thinks the present impost of 3d. per lb. is equitable. The former gentleman does not believe in the system of conferring bonuses, but the latter would prefer a bonus to an increase in duty.

Mr. R. S. AIKEN (Bundaberg): Mr. Warren argued that because the sugar-grower received a bonus, so should the coffee-grower. For the information of that gentleman, I may say that we, who are engaged in the sugar industry, look upon that bonus simply as compensation for undue interference with our labour. Those who are engaged in the coffee industry were never, by legislative enactment, promised a certain kind of labour, and the two cases are in nowise similar.

Mr. E. SWAYNE (Mackay): In the Mackay district coffee is a comparatively large crop, and the view held there by the growers is, that the greatest benefit that could be conferred on the industry would be to increase the import duty. The other day our association received an invitation to lay any grievance we might have before the Tariff Commission, and I presume other agricultural societies received the same communication. At any rate, after consulting with our coffee-growers, it was agreed by our association to ask for an increase of 2d. per lb. duty on both kinds of coffee. Many of you will know that there is one duty for raw coffee and another for the manufactured article. Under the old State tariff the duties were 4d. and 6d., but under the federal tariff these were reduced to 3d. and 5d. The Mackay growers now ask for an increase of 2d. under each heading, bringing the two duties up to 5d. and 7d. If we are not in unison on this matter, it will be better for the coffee men to combine amongst themselves and arrive at a definite understanding as to what they really want, in the same way as the sugar men did. Personally, I should

like to hear whether the action proposed by the Mackay coffee-growers, *re* an increase of 2d. per lb. on the duty, meets with the views of the coffee men from the other districts. Mr. Burnett is from the South and Mr. Warren from the North. I come from about the Centre, and I think we ought to be able to come to some understanding upon the question to lay before the Conference.

Mr. B. T. McKay (Maryborough): In speaking of the matter of coffee, I think certain words used in connection with the bee industry apply to a certain extent to the coffee industry. I do not think our markets are exploited in the matter of coffee and the making of it known as they should be. Coffee is nothing without aroma. We are the greatest tea drinkers in the world, but the reason is, because we cannot get good coffee. I ask any of you, since you came to this town: Have you had a decent cup of coffee, even though it is the centre of a coffee district? I have had coffee from Buderim Mountain, but it was not what I would call coffee. If you could bring someone here to show you how to prepare the coffee it would be all right. France is the place for good coffee, and I am quite sure that if the people of Queensland and Australia could get at their meals the "*café au lait*" a man gets in Paris, you would not have much difficulty in finding a satisfactory market for all the coffee you could grow.

Mr. W. W. Burnett: Personally, I am not a coffee expert, although a grower, and I do not claim to know anything about the fine qualities of coffee. This coffee, however, which I have here, took the gold medal at the Earl's Court Exhibition, the bronze medal at the Columbian, and a bronze medal at the Indian and Colonial Exhibitions. That speaks something for our coffee. With regard to the tariff, it is the opinion of our people that it would be advantageous to us to get the old tariff back. Such an increase would not affect the Commonwealth at all, and would merely have the effect of keeping the imported coffee out. That is our object in seeking to get the old tariff back.

Mr. R. W. Warren (Cairns): My object in suggesting that the duty be retained at 3d. per lb. is in view of the fact that we are the only part of the Commonwealth that grows coffee. The Southern portion are the consumers, and we have got to recognise the fact that a large number of the members of the Federal Parliament are free-traders. If we try to get the duty increased on coffee we shall simply not get it, but we may have a chance of getting a bonus. My object in asking for a bonus is in view of the fact that when a man undertakes to grow coffee, he has to clear his land, plant his trees, and wait for four years for his first crop.

The Chairman: Do you want a bonus on the plants?

Mr. Warren: No. Although we in Queensland had a high duty, we used to get bigger prices for our coffee in a country where there was no duty. As for what Mr. McKay said, you will find they give you a better coffee in France because of the roasting. They get their coffee from the West Indies.

The Chairman: I would ask Mr. Burnett: How much did you get per acre?

Mr. Burnett: It varies very much. Our land is not measured.

Mr. Newport: You can get from 5 to 7 cwt. the fourth and fifth years. After that you should be able to rely on 10 cwt. per acre. That figure has, of course, been exceeded, and at Atherton, which you will visit to-morrow, you may see a plantation where they got over a ton per acre last season.

The Chairman: It appears to me from some figures that have been supplied that one Queensland grower realised £84 per acre gross, and it cost him £28, which leaves a net profit of £56 per acre. Another got £56 gross, which still cost £28 to produce, so that he also got £28 net. Even though the cost of production is heavy, if coffee can be cultivated to realise anything like the above amounts per acre, it is a question whether it needs the assistance of a bonus. The following resolution has been proposed by Mr. R. W. Warren and seconded by Mr. W. Burnett—"That this Conference is of opinion that the coffee industry requires a penny per pound further protection to cause its development."

The resolution was carried.

ENCOURAGEMENT TO LAND SETTLEMENT.

[By W. S. Palmer.]

A few remarks on such an important subject may not be out of place on such an auspicious occasion, and I trust may induce and result in some profitable discussion by the delegates to this Conference.

Educating and Training of our Boys.

I am of opinion that no phase of this great question is of more importance or requires more urgent consideration than that of providing better facilities for our boys to obtain a rudimentary training in agriculture (theoretically and practically) to fit them to make a living on the land. A little training at the beginning would undoubtedly result in a great saving, both financially and bodily, and make the venture a success where otherwise failure would ensue. I would lay emphasis on the great value of a little practical training in this connection—if only instruction in the handling and use of up-to-date farm implements and machinery, together with some knowledge of rough carpentery work. It is not every youth that can get to an agricultural college at the southernmost end of the State. I would suggest the extension of State experimental farms, on which the practical information already alluded to might be supplied. The varied climatic conditions of this State alone demand some such extension. Take Bowen and Cairns, for instance—the one with a dry atmosphere, and the other humid—naturally designed to produce somewhat dissimilar results. On these farms lectures might be arranged periodically, attended by practical demonstration. If we wish our boys to take up any branch of agriculture for a livelihood, and to be successful, we must see to it that the best and every facility is afforded them for study at the smallest expense. The subject of agriculture might, with advantage, be further introduced into our State schools curriculum, with better and easier access by scholarship to the agricultural college. In conjunction with this primary education, everything should be done in the way of popularising the industry.

I hold, and I am speaking from experience, that the rapidly growing alien competition in the Northern parts of our State, and their leasing and occupation of our lands, has a strong tendency to check the occupation of those lands by a more desirable class, and to make the industry generally unpopular in the minds of our young men. I cannot conceive that the splendid lands of North Queensland are unfitted to carry a white farming people, and this unfair competition is very menacing to land settlement by European races. Our young men are not likely to take kindly to fruit-growing or farming in the face of this competition. The land speculator, who is generally at the bottom of this business, should be discouraged at every point, and every advantage and assistance given the *bonâ fide* man—the man whose aim and ambition is to secure a piece of land whereon to make a home and a living. The question of a free grant under certain conditions to such as he, together with financial assistance, is worthy of special consideration. Working somewhat on these lines, Canada has attracted to her shores large numbers of desirable settlers.

The financial question is undoubtedly very important. It may be said, and truly, that our agricultural bank is supplying a long-felt want in this respect, and has done much to assist the settler; but I am of opinion that the conditions under which money is loaned to agriculturists require widening even yet. Through stress of seasons or other unforeseen cause, money may be required to provide food and clothing, against which the door is closed. This may mean in some cases to the beginner failure, and to the established farmer the necessity of mortgaging his property at a crushing rate of interest. I do not see why the money should not be loaned, unconditionally as regards its use, to the *bonâ fide* agriculturist, provided the security is right. It is unquestionably a good thing to assist a man to get on the land; it is obviously also a good thing to help one who is already established to tide over a period of misfortune, and this brings me to the all-important matter of providing markets.

The certainty of a market for produce is without doubt the crux of the whole question, and a powerful factor in inducing land settlement. Given a market and remunerative returns, production will rapidly follow. The search for markets is certainly the State's concern, and the expenditure necessary cannot be objected to by right-thinking people. We have not been lavish in this respect compared with other countries. The delegates to this Conference, I am sure, will approve of the action taken in this matter by the present Minister for Agriculture. Although receiving a good deal of abuse from certain quarters at the outset, he has not faltered in this all-important question of opening up markets. Although

the atmosphere is thick with economy at the present time, we cannot afford to economise in this respect. With regard to oversea markets, much has been done recently to ensure the landing of our butter in England in good condition, and the very satisfactory price lately realised—viz., 102s. per cwt.—indicates the greatest success. The effort to work up a trade in dressed poultry is to be commended, and should prove a large and profitable industry and a valuable adjunct to other phases of farming. There is another industry which I feel sure has a big future before it, and could be developed if it were taken in hand as it should be by the State. I refer to the exportation oversea of citrus fruits. We have the lands and climate in this State suitable for the production of this class of fruit of the very best quality; and my experience of the fruit industry, extending over twenty years, justifies my saying that I am positive that it can be landed in England in first-class condition. An experimental shipment quite recently by the Citrus-growers' Association proved a failure, and the growers suffered a heavy loss thereby; this I attribute to inexperience, want of knowledge of the proper conditions as regards carriage, &c. I would suggest that the Department of Agriculture institute a series of experiments on land, with regard to temperature most suitable for preservation, and also to determine the value of the close case as against the open or *vice versâ*. I feel assured that experience gained in this way will help considerably to establish the industry, which should be an exceptionally valuable one to this State.

Better facilities for the carriage of our perishable produce to market is also the State's concern. In the Bowen district alone hundreds of pounds sterling have been lost recently through unsuitable carriage conditions on the coastal steamers.

If these matters were attended to, the lot of the agriculturist would improve, and even in this despised North would find white settlers brave enough to tackle the business, in the hope of obtaining a livelihood, and run the risk of turning black in the attempt.

To sum up—to make a success of land settlement—encourage the *bonâ fide* farmer in every shape and form. Discourage the other man—the speculator—kick him out of the business, and the industry may yet be as it should be, the backbone of the country, and draw to its ranks the very best of our people, and be a future recruiting ground to stem the tide of physical degeneracy at present threatening our race.

LAND SETTLEMENT IN QUEENSLAND.

[By Ernest E. Dalton, Brookfield.]

In writing a paper on the above subject, I am indeed sensible of the magnitude of the task, and I feel that I cannot treat the subject at all adequately in a paper like this.

Land settlement in Queensland is, at the present time, attracting a very considerable amount of attention, and every week large areas of Crown lands are being "taken up" or selected. When in the Brisbane Lands Office a few days since, I saw a long list of addresses of persons desirous of acquiring land, who were communicating with the Department, to ascertain if they could be suited by the Department with some of our vast territory.

That our land is in demand, and is popular with dairymen from the Northern Rivers of New South Wales, is evidenced by the fact that quite recently a group of twenty-two dairymen from the sister State have taken up or selected a lot of land as a group in the Cooran district, North Coast line, and it is all scrub.

It is conclusively proved then that our lands are in demand. The question then that naturally arises is: "Is our Lands Department catering for the wants of would-be landowners in as efficient and business-like a manner as it is possible to do?"

A very good feature in the Brisbane Lands Office is the Inquiry Department, where information, to a certain point, is given as to the quantity, quality, and position of certain lands open or to be opened to the public for selection or purchase. Now, while as already has been said, this is a good plan, yet it appears to me that a great deal more could be done to assist the intending selectors with information.

I am of opinion that, in connection with this Department, accurate information should be imparted more fully. By this I mean—a system should be evolved whereby the nature and quality of soils and accessibility of the land inquired about should be imparted in detail. If procurable at the office, this information would save, in many cases, the selector from going to inspect lands which on such

inspection prove to be absolutely unfit for his particular requirements. Consequently much time and expense would be saved the selector. It would be a very simple matter to appoint a few men of undoubted experience to report on the various lands opened for selection, and whose reports would at once direct the farmer, the husbandman, the grazier, the dairyman, or the fruit-grower, as the case might be, as to what land, and where situated, would suit his particular purpose. That such information is not at present obtainable I am able to assert. The cost of this system would be comparatively small, but, if it were an objection to appoint men for this purpose, would it not be practicable for the surveyors of each portion of land surveyed by them to give an exhaustive report on the nature of same in detail; much benefit would be derived in this way.

It is frequently the case that men who are desirous of settling on the land have little or no capital, and it is to these men the suggestion made here, if put into practice, would prove a great boon.

Then, it appears to me that some system should be initiated whereby the man who has no capital, and is desirous of settling on the land, may be assisted.

One meets a number of young men constantly, who say that, if they could only get enough cash to enable them to live until they could receive returns from the land, they would be only too glad to take up selections and work them.

It must be admitted that the Amended Agricultural Bank Act, as now in force, is a credit to the Government and the country, and the salvation of many a man on the land, but it does not help the man who is absolutely without capital.

There is a system in practice whereby those who are unable to obtain employment are given sufficient relief by the Government to keep them living. Now, in a great many instances the country has no hope of receiving the amount of such relief back again, so gets nothing in return for its money. Many able-bodied young men are included under this heading.

It would be very much better to allow those who were desirous of so doing (and, if the suggestion about to be made were put into practice, a large number would do so) to take up a portion of land, the land ultimately to become theirs, on certain terms, and on the performance of certain conditions; but, for, say, six or twelve months at most, the land to remain absolutely the property of the Crown, and a fair allowance to be made the farmer for all permanent improvements effected, and he to be paid for same by the Crown. Immediately on that farmer reaching a stage when he would be receiving a return from his land, the system of payments for improvements effected to cease, and the rental purchase money, and repayments for improvements (combined) to be exacted by the Government on easy annual instalments.

There is no question but that if this principle were put into practice a vast area of our unoccupied lands would be taken up, and those who really have at heart their own betterment (and I assert they are the vast majority) would have a splendid opportunity of getting for themselves a home, and the great and burning question of the unemployed would be very materially relieved. The State would run absolutely no risk, as it would only pay for permanent work actually performed, and thus, of course, would get good value for the money expended.

I am speaking from personal experience when I say that, to a young man starting on a selection (scrub, for instance) without any capital, the struggle for the first twelve months is indeed severe, and a man is very often compelled to take his heart as it were in his teeth if he is going to make a success of the venture, and thus a living for his family and self.

I have no sympathy with the system which has recently been advocated by the Brisbane daily Press—viz., to provide a man with residence, stock, and implements, and then for him to have easy and extended terms by which to liquidate his indebtedness. I am afraid that the system would be a very big mistake in the majority of cases, as we cannot get away from the human fact that the easier a man acquires a thing the less, proportionately, does he value it.

Put a man on the land under the lastnamed conditions, and I am very much afraid that the Crown would own the holding indefinitely. Of course, I admit, in cases where the man was a genuine "sticker," the case would be different, but, as a general thing, I say it would be unsuccessful.

On the system outlined, in the matter of making a settler a fair and reasonable payment for the work done on the holding for a maximum period of, say, twelve months, I venture to assert that the practice would be an unqualified success, because, in the first place, it is a very poor man indeed that would not earn enough by improving his holding in twelve months to keep him two years at the least; and, again, this system would enable him to remain on his land the whole

of his time, and give him a chance of gradually acquiring cows, horses, pigs, fowls, and implements, and given these, with the exercise of a policy of thrift and industry, we all know where that man would be in a very few years.

I would also go further, and have the Government appoint instructors in agriculture. By this I do not mean "experts" as the term is generally understood, but men who have been actively engaged in agricultural pursuits (including, of course, fruit-growing), and who would be required to travel through all districts, and to take off their coats and give "practical demonstration" as to how it should be done when they see settlers struggling along "in the rut."

I am sure we have all seen, and would have been amused were the subject not too serious and grim for humour, numbers of men toiling and moiling on land absolutely unfit for the purposes to which it was being put. Of course, I am quite aware that some men we meet know everything, and can be taught nothing, but we must admit that most men are reasonably intelligent, and are desirous of learning all they can, and it is for these that I speak.

Now, while the exterior only of the question has been merely touched upon, I will conclude by epitomising the subject-matter under three heads, as follows:—

First: Absolutely reliable and exhaustive information should be obtainable at the different land offices with regard to each piece of land opened for selection, and the fullest data given as to what the land is most suited for, nature and depth of soil, and every particular given.

Secondly: A system of encouragement and assistance should be given the would-be settler who lacks capital, by paying for all permanent improvements done on the holding, up to a certain proportion of the fair value of such improvements, and up to a certain period. When the selector is obtaining returns from his holding, payments to be received from him covering cost of land and repayment for improvements effected. The whole, meanwhile, to remain absolutely the property of the Crown.

Thirdly: Instructors in practical agriculture should be appointed, whose services should be available at any and all times for practical demonstration to the selectors, and instruction given in the particular branch of agriculture which the settler to be instructed is following, thus saving settlers much loss of time and needless annoyance, worry, and expense.

Mr. T. E. Coulson (Rosewood) said the first great thing in the land settlement question was good land, and those who had knocked about the country knew very well that hundreds of instances could be found where people had settled on land on which they were wasting their time and breaking their hearts. Many a man, in his desire to make a home, struggled against Nature for many years on unsuitable land, but ultimately had to leave his selection, go into the towns to swell the ranks of the unemployed, and perhaps curse the day he ever set foot on Queensland soil. The experience of such men, of course, deterred others from settling on the land. Mr. Coulson, however, was glad to say that he was able to acquit the present Government of the slightest desire to foist inferior land on to selectors, and he wished to congratulate that Government on the honest efforts it was making to promote land settlement by offering, in the first instance, decent land, and, in the next, by offering every encouragement for that land to be taken up. There was one thing, however, that he would like more attention given to, and that was that, in the cutting up of properties intended to be thrown open for selection, every possible provision should be made for water reserves. Mr. Coulson instanced one case in which, if he had not personally interviewed the late Mr. O'Connell, the then Minister for Lands, the only spring in a particular locality which was being thrown open for selection would have fallen into the hands of the selector who was fortunate enough to secure the piece of land on which the spring was. Mr. Coulson further thought that more people would avail themselves of the opportunity of selecting land if there were bigger areas thrown open. Recently there were seventy-two portions thrown open in the Burnett district, and he had put in two applications for two selections for two of his family. For one of those selections there were twenty-three applications, and for the other nine. As might be anticipated, he got neither; but what he wished to point out was, that twenty-one people from his own district went up to the Burnett in connection with that land, and very few of them were able to get what they wanted. The money and time of most

of those men were consequently wasted. The railway fare alone for each was £2 5s., and, of course, they all incurred other travelling expenses.

Dr. Macdonald (Geraldton) said that Mr. Ryan, of the Mosman, had desired him to point out that 4,000,000 of people could be settled on the land between Lucinda Point and Port Douglas. Mr. Ryan claimed that there was room for twenty sugar-mills between those two points with their attendant thousands of acres of cane on the Bloomfield, Russell, Barron, Freshwater, and Tully Rivers, not to mention innumerable creeks. Mr. Ryan was a staunch believer in the central mill system as an aid to land settlement in North Queensland, and had asked the speaker to move the following resolution:—"That in the opinion of this Conference, in view of the necessity for land settlement in North Queensland, the Government be asked to continue its efforts to develop the central mill system."

Mr. D. Pearson, of Ingham, seconded the motion, which was carried.

NEXT CONFERENCE.

The Chairman: That completes the agenda-paper; but it has occurred to me that some of you may have a few suggestions to make with respect to future Conferences.

Mr. W. Deacon (Allora) thought the next Conference might be held a little later in the year than the present one.

The Chairman said a Conference later than May would have interfered with cane-cutting operations.

Mr. Deacon said there were two seasons a farmer could not neglect, and they were seeding and harvesting times. June might suit those from the Downs, or perhaps July, or perhaps March.

Mr. T. E. Coulson (Rosewood) thought that perhaps in the early stages of the Conference the different industries might have different meetings. Subjects of general interest could be threshed out by the whole Conference, which could also deal with resolutions and recommendations from the sub-meetings.

Mr. D. MacBrair (Runcorn) suggested that it might be worthy of consideration that those papers which were printed be taken as read, but this suggestion did not appear to find favour with the other delegates.

Mr. A. W. Cameron (Maryborough) thought it would facilitate business and increase the value of the discussion if it were made a rule that every paper be first sent into the Department, which should take out extraneous matter, put the paper in as concise a form as possible, and then have copies printed for presentation to the Conference. The audience would then be better able to grasp the meaning of the paper, and would be better able to discuss its merits.

Mr. B. T. McKay (Maryborough) thought all papers should conclude with a resolution.

Mr. Deacon (Allora) suggested that the next Conference might be held in Brisbane, but the Chairman pointed out that that was hardly a matter for the present Conference to discuss.

The Chairman said Mr. Cameron had handed him the following resolution—"That the Department insist upon all papers being submitted to the Under Secretary, who would have the right to edit same, and that every paper conclude with a resolution."

Mr. G. A. Ball (Killarney) seconded the motion. He thought long papers prevented discussion.

Mr. J. M. Hunter (Roma) thought it was a good idea to print the papers, but he was inclined to think it would be a mistake to make it imperative that each paper conclude with a resolution. Right through the Conference there had been similar papers on the same subject, and if each had concluded with a resolution, difficulties might have arisen. He thought resolutions might come

in after the papers had been read and the discussions on them had taken place. They would thus be able to crystallise in the resolution the combined ideas of the papers and speakers on each subject. For that reason he desired to see the last part of Mr. Cameron's motion eliminated. He also thought it hard to get wheat-growers to attend a conference at sowing time. To fix a hard-and-fast date for the time of the next Conference would be unwise, but he would suggest that the place of meeting determine the time of the Conference. For the present Conference he thought the best time possible had been selected. Going West—and he thought the next Conference should be in the West—the best time would be when the wheat-fields were in bloom. That would give visitors some idea of the value of the country. September or August would be suitable months, for the wheat would be getting into ear, and the busy season would hardly have commenced.

Mr. T. Tennison (Kilkivan) inquired why a resolution which his association had submitted for presentation to the Conference had not been included in the business sheet, and was informed by the Chairman that the request contained in the resolution was already provided for by legislation.

The Chairman said the idea of Mr. Cameron's resolution was that the writer of every paper should have some definite end in view when writing the paper. By making it imperative that a paper should conclude with a resolution it might be fairly anticipated that they would get something definite from all the papers. Of course, in the matter of editing, the editor would never dream of interfering with a writer's facts or sentiments.

Mr. Deacon said that if the next Conference were held in Brisbane it would not matter much when it was held.

Mr. H. E. Bray (Tinana) said that in fixing the time of the next Conference it might be best to study the convenience of those who had to travel furthest. In any event, he thought it would be better to leave the matter in the hands of the Minister for Agriculture and his Department. (Hear, hear!)

Mr. Deacon (Allora) suggested that the next Conference be held in Brisbane. Although the capital of the State, it had never had an Agricultural Conference. It was surrounded by agricultural settlement, and in the evenings he thought the delegates might be allowed a little relaxation. There was a Press, moreover, which would give a wide publicity to their proceedings. They would have in addition the benefit of the attendance of all the experts of the Department, and he thought all the experts should attend the Conferences.

The Chairman said that before the Conference broke up he wished to thank all the delegates cordially for the very earnest way they had applied themselves to business, and for the regularity with which they had attended the sittings. He hoped that the result of the Conference would be the material advancement of their individual interests, and of the State as a whole, and possibly of legislation that would give effect to their desires.

On the motion of Mr. N. McKenzie, of the Combined Moreton Association, a hearty vote of thanks to the Chairman concluded the sitting.

Wednesday Evening, 17th May, 1905.

SMOKE CONCERT.

The Conference was practically concluded by a smoke concert, given in honour of the delegates, on the evening of the 17th May, by the people of Cairns.

After the toast of the King had been honoured, the mayor (Mr. C. McKenzie) proposed the health of the Chairman of the Conference, whom he characterised as the most progressive Minister that had ever been to Cairns.

The toast was supported by Mr. J. G. Fearnley, the president of the Cairns Agricultural, Pastoral, and Mining Association, and drunk with musical honours.

The Hon. D. F. DENHAM, M.L.A.: Lately, in responding to toasts, my name has been associated with that of the Ministry, and under such circumstances you can receive the kindest things possible that can be said about you, because you can feel that they are not intended for yourself entirely. When "The Ministry" is proposed, one is glad to hear the kind things that can be said, but to-night you have said things concerning me personally which I really think are altogether too kind. I must confess that, in undertaking the position of Chairman to the Conference, I did so with a considerable amount of anxiety. I naturally wanted the Conference to be an unqualified success, but I had never had the pleasure of attending a previous Conference, either as a delegate or in any other capacity; consequently, everything was new to me, but, doubtless, none the less pleasant. Just as the cane-grower with a fine piece of soil gets from the soil a good crop of cane, so I found I had a splendid lot of delegates, and I do believe I have extracted from that delegation a very fair amount of business. The State of Queensland is essentially one for the primary producer. We are here as a number of toilers in one sphere or another. We are all workers. Business is what we are after. The farmer who has a cow does not simply require an animal with teats, but an animal that will be to him as a machine that will convert grass into milk, so that he may get profit therefrom. He wants a business-like animal. The man who is converting land into cane wants good soil, good water, and good methods if he wishes to get the best possible results. Business was the keynote of our meeting, and I believe, as an outcome, good will result. I must confess the aspect of the Conference which gave me most pleasure was the spirit of sweet reasonableness with respect to those resolutions dealing with the big interests of the sugar industry. We recognise that the desire of the Commonwealth is that the sugar industry may be worked by white labour, but the resolutions that have gone forth from the Conference are such that I think it will be recognised that the residents in the North are prepared to comply with the Act in all respects at the earliest possible date. What are the resolutions? First of all, that the bonus must be continued, and continued for a fixed period of time. I was on the Johnstone a few days ago, and was taken to the site where it is proposed to erect the Johnstone central mill. The site is admirable. Its erection would not conflict with the interests of the Goondi mill, or any other mill. They have made arrangements for the cutting up of the land into small lots, and working same entirely by white labour. But, while they are confident of conducting the industry on the small area principle, I do not think, as one who might be responsible for the public funds, that I could in any wise acquiesce or urge the loan for the erection of the mill unless there was an assured period during which the bonus at least would be paid. We have to remember that in Australia we are entering upon an era of experimentation with respect to cane. Hitherto, all the cane in the world has been grown by cheap labour. Australia has said it shall be grown by white labour, and as that is the order, it is for Australia to stand by those men who are loyally trying to obey the edict. In a year or two we may find a considerable difference in the price of cane. There are some who hope the present values will be continued, but we must remember we have to contend against the world's supply, and that the prices will be controlled by the total output. In the matter of production, with such an article as sugar, the quantity produced can be increased according to the areas of cane planted. It is otherwise with cattle, for you cannot force an increase there. But, with regard to sugar, the areas under beet are being largely extended, and in the Indies every available piece of land is being put under cane for sugar; so that it is quite possible, in the course of a year or two, the supplies may be so large as to cause a considerable variation in the price. In anticipation of such variation, it is of the utmost importance that the bonus should be continued. I sincerely trust the Federal Authorities will not hesitate

to continue the bonus, and not for a few years, but for at least ten years. Those who have asked that the Immigration Restriction Act should be amended realise the difficulty in respect to the quantity of labour available for their purposes, and they say, "Do not forcibly deport the coloured labour; let the difficulty automatically solve itself; let those who wish to go, go, but do not send away those who desire to remain." Those who talk on those lines are agreeable for the bonus to be retained, for they wish to see this magnificent Northern territory settled by men and women of our own kith and kin. I had never passed beyond Townsville perviously, and my visit to the Herbert was a revelation. There I saw vast tracts of magnificent soil, splendidly watered. The grass itself was between 5 and 6 feet high, and altogether I doubted whether I should ever put foot on finer land. But when I came further North, on to the Johnstone, I found country equal, if not a little superior, to that on the Herbert. I have not yet had the pleasure of seeing the Mosman and Mulgrave, but I have had descriptions of these districts, and it seems that the country there is equally rich and glorious as the country we have passed over. Now, what a vast territory this Queensland is, and what a rich country it is! Its possibilities are simply stupendous. On the Darling Downs we have magnificent stretches of country, and the uses to which they will be put are dairying, and lamb and sheep raising. In the West we have got some of the finest wheat and barley land in the whole world. We may then pass away to the vast plains of the West, concerning which I hope the day will not be far distant when there will be carried into effect the resolution carried at the Conference to-day, asking that a system of light railway lines be initiated to save the herds of the pastoralists in time of drought. To my mind the pastoralists will be prepared to pay a premium in respect thereto, because the light railways, and what the pastoralists may pay towards the construction of same, will be in the nature of an insurance scheme. From the pastures of the West, we pass to the mineral districts, and from them to these magnificent rich coast lands. Concerning your town of Cairns, I must admit that I have been agreebly surprised. I had a preconceived idea of the place, and have to confess that your town and the arrangements are immeasurably superior to what I had anticipated. I grant you I ought to have known better, but I believe I have brought with me forty-five men who, when they go South, will so dilate on the rich and fertile country and prosperous town that they have seen that there may be immigration coming North and settling, as an outcome of this Conference. Cairns is uniquely situated. I am not prepared to say it was a wise thing for the railway to go out from here, but there it is, and there it will remain. Yet you have on either side of you, on the coast, magnificent land capable of producing almost anything, including all those subsidiary crops which were mentioned yesterday by the Instructor in Tropical Agriculture. It does appear to me that the sugar men have been doing so well out of sugar that they have overlooked the subsidiary crops, which would add to the figures in their cheque-books. Those subsidiary crops should be to you what the pig-raising and poultry-rearing industries are to the farmers of the South. Right at the back of you you have wonderful mineral resources, and if there is one thing more than another that I hope with respect to the mineral deposits of North Queensland it is, that the negotiations that are pending for the extension of the railway from Mungana down to the Etheridge will be consummated. I know nothing of minerals, but I recently had an opportunity of conversing with a gentleman who had been interested in that locality for a number of years. I met him on the "Barcoo" the other day, and from what he told me, I do not think there would be anything in the nature of a speculation in building that line. I gathered that when that line is constructed there will grow up at the back of you a population not unlikely equal to that of Charters Towers. What more do you want? You have the soil and the rainfall, but what you want is a vast number more men and women of your own colour; and what I hold is, that judicious effort and legislation will bring about a white Australia in the North. The sudden deportation of the coloured labour at

present here, however, may perhaps retard the realisation of that ideal; for, if these men are now sent away, much of the fine sugar land of the North will pass into the hands of aliens as lessees. The matter was brought before me at Bowen that a quantity of land in that district was being leased to aliens, and I heard the same story again on the Johnstone River. There I heard of whole plantations that were likely to pass into the hands of aliens because of difficulties encountered in respect of labour. Would it not be better if we could persuade the Federal Powers to amend the Restriction Act so that we might be permitted to introduce European immigrants, bring them under contract for a year or two as ploughmen, &c., and arrange that after that time they take up land under tribute, ultimately becoming owners? Since my arrival in Cairns I met an apparently prosperous farmer, who assured me that when he came here he had exactly 3d. When I heard one of the papers read at the Conference to-day about encouragement to land settlement and the inadequacy even of the provisions of the Agricultural Bank Act, my mind instantly turned to this man with his 3d. He, when he came here, made arrangements with Colonial Sugar Refining Company, but has now a freehold of his own, and appears to be doing very well indeed. If we could introduce suitable agricultural labourers from Europe under arrangements by which they would work for us for a year or two, we should have largely solved the problem of North Queensland, and, in the course of a few years, we should have what we all want—namely, a white Australia, and a land settled by white men and not, as now threatens, a land owned by white men but leased to and cultivated by Chinamen. It is all very well to talk about introducing a Bill to prevent land being leased to aliens. Such an Act could easily be evaded. I remember once, in South Australia, something went wrong with the divisional board I was interested in. The delinquent was brought up before the court, and although his guilt was apparent to everyone he escaped on a technical objection. I said to his lawyer afterwards, "It is unfortunate that the course of justice should be blocked by such a technicality as that," when he replied, "Oh, I saw that flaw in the Act when the Bill was going through." We want the land settled by white men, and to attain that wish something more than a Bill to prohibit the leasing of land to aliens is needed. The bonus, for one thing, must be assured. There is nothing worse than uncertainty, and we must know that we are going to have the bonus for a fixed period of time. If Australia has said we must be white, then it is only fair that Australia should pay something towards the price. All the dues that prevailed against the other States have been abolished, all the barriers are down; and the manufacturers of Melbourne, as a consequence, have been able to enormously increase their output. For every pound they may have paid in respect of the bonus they have received in return several pounds, and I hope the federal spirit, if it ever prevailed, will prevail now. I must say, Mr. Mayor, how we appreciate the kind arrangements you have made for our entertainment. We came on agricultural matters primarily, but we have learned a good deal about your interests; and in the coming days, if we ever have to say a word or cast a vote for a matter in which North Queensland is interested, we will realise that North Queensland is a part, and no inconsiderable part, of a great whole, that our interests are identical, and that what affects us also affects you. I thank you, Mr. Mayor, and you Mr. Fearnley, for your courteous remarks, and all of you for the kindly way in which you have drunk my health.

Other toasts were "The Visitors," proposed by Mr. R. A. Tills, and responded to by Mr. J. M. Hunter, of Roma, and Mr. G. A. Ball, of Killarney; "The Agricultural Industry," proposed by Mr. G. R. Mayers, and responded to by Mr. E. Swayne, of Mackay; and the "Sugar Industry," proposed by Mr. A. W. Cameron, of Maryborough, and replied to by Mr. J. Mann, M.L.A.

The concert practically concluded the Conference, although the majority of the delegates spent the remainder of the week in the Cairns district, visiting, amongst other places, Atherton, Chillagoe, and the Kamerunga State Nursery.

HISTORY REPEATS ITSELF.

The most effective method of getting rid of all trouble in connection with the fruit fly and other orchard pests, as practised by a delegate to the Conference—namely, the abandoning of his farm—cannot be claimed as a novel one. "Hortus," in the *People's Journal*, N.B., invoked the Muses, to record similar action on the part of a Scotch gardener, as follows:—

THE GARDENER'S WAIL.

Wauken, my muse! yer loodest wail,
Lend to proclaim the waefu' tale,
O' a' the ills that do assail
The gairdener's occupation.
If ere by chance ye meet a chiel,
Wi' careworn face an' een that feel,
An' doonbent head, then mark him weel—
His wark is cultivation.

Auld Milton said—I have heard tell
When Adam's curses cam' pell mell,
That maistly on the ground they fell,
As aff his head they glinted.
I weel believe't: the son o' toil,
Wha's lot hae fa'en to till the soil,
For want o' care will never spoil—
His sorrow's never stinted.

Lang syne, when Adam sawed his seeds,
Ere he began his evil deeds,
He ne'er was bathered pu'in weeds—
Sae says the auld narrator.
But noo, as sune's we tak' a spade,
An' get oor bit o' gairden made,
Gaints us we quickly find arrayed
The very pooers o' natur.'

If even the seasons had the grace
To come in turn an' keep their place,
We wadna' hae sae much to face,
Nor view wi' consternation.
In summer, when we look for heat,
We're cursed wi' shooers o' hail and sleet;
An' autumn's early frosts complete
The wark o' devastation.

The rain has ruined oor crap o' Peas,
The blight has spoilt oor Aipple trees,
Oor grozets* covered wi' green flees;
An' then the festive snailes
Did quickly seal oor Cabbages doom;
Sma' wonner tho' we fret an' fume
To see oor best Chrysthan'mum bloom
Nabbed by the forky-tailies.†

Oor foes are mair than mind can grasp—
The grub, the weevil, bug, an' wasp,
Worms for the Carrot an' the Rasp—
In truth their name is legion.
But, faith, I'll shak' the gairden mud
Frae aff my feet afore I'm wud,
An' quickly pack ilk stick an' dud,
An' try some ither region.

* Gooseberries. † Earwigs.

Answers to Correspondents.

WARTS ON A BULL'S NECK.

Ayrshire, Alton Downs.—

Remove the warts by twisting off with the fingers or with a small pair of pincers. If they cannot be removed in this manner, cut off, or, better still, burn off. After removal apply strong acetic acid twice a week.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

Stations.	1904.							1905.					
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
North.													
Bowen	0·30	Nil	Nil	Nil	1·66	0·16	4·33	22·69	0·50	1·17	5·72	0·72	0·53
Cairns	Nil	0·35	0·62	0·12	0·37	0·42	7·88	25·74	8·59	6·81	6·92	3·89	1·94
Geraldton	0·39	1·78	3·99	0·76	2·49	1·18	7·35	28·37	5·71	8·26	20·51	13·35	9·39
Herberton	Nil	Nil	0·59	0·44	0·62	1·15	2·06	7·39	3·37	0·75	2·41	2·67	1·17
Hughenden	0·44	Nil	Nil	0·22	4·10	1·76	0·28	3·37	0·07	0·70	3·84	Nil	0·41
Kamerunga	Nil	0·42	1·05	0·27	1·00	0·43	11·62	29·08	7·56	4·38	8·89	5·63	2·59
Longreach	0·04	Nil	Nil	Nil	4·66	0·72	1·34	1·17	0·53	0·17	2·41	Nil	Nil
Lucinda	Nil	0·45	Nil	2·00	1·90	0·50	2·10	15·40	1·68	2·79	23·06	3·15	1·92
Mackay	0·93	0·12	0·04	8·14	8·07	Nil	1·52	29·89	4·73	3·67	13·19	2·17	1·82
Rockhampton	1·26	0·03	Nil	0·22	1·36	1·32	1·60	15·39	0·92	0·09	8·93	0·95	0·54
Townsville	0·04	Nil	Nil	0·04	3·67	1·17	5·70	13·71	1·97	2·02	6·41	0·52	0·35
South.													
Barcaldine	0·16	Nil	Nil	0·20	3·88	1·02	6·54	1·85	0·12	0·25	1·56	Nil	Nil
Beenleigh	0·15	1·54	0·25	2·11	1·89	4·43	4·55	5·44	3·04	2·91	3·63	2·21	0·40
Biggenden	0·71	0·29	0·29	Nil	4·06	1·08	5·89	13·05	1·94	3·61	3·81	*	*
Blackall	0·32	0·12	0·14	Nil	4·99	0·53	5·04	3·19	0·23	2·34	5·02	0·21	Nil
Brisbane	0·59	1·48	0·53	1·59	1·28	2·36	3·65	9·09	2·64	2·65	4·50	1·10	0·39
Bundaberg	0·86	0·51	0·62	0·48	3·32	0·16	5·16	16·67	2·17	3·35	6·31	4·26	1·10
Caboolture	0·17	2·12	0·30	1·53	2·42	3·07	7·36	8·10	3·43	3·57	4·89	1·65	0·26
Charleville	0·31	0·52	0·15	0·40	3·14	0·09	2·51	1·70	0·73	1·67	3·87	0·63	0·01
Dalby	0·34	2·63	0·24	3·01	1·07	2·59	2·15	3·40	0·74	5·46	3·09	2·19	0·25
Emerald	0·96	0·06	0·09	0·06	1·44	2·43	2·44	7·77	0·25	1·76	6·00	0·72	0·06
Esk	0·20	2·43	0·33	3·10	2·90	2·90	3·07	8·26	0·85	1·87	3·52	1·68	0·33
Gatton College ...	0·45	2·12	0·07	1·09	1·95	1·14	2·42	5·57	1·10	1·71	4·22	2·56	0·26
Gayndah	0·93	0·99	0·41	0·27	2·49	0·67	2·36	11·34	0·82	1·58	4·06	1·07	0·42
Gindie	0·43	Nil	0·21	0·02	3·09	1·55	2·02	7·07	0·06	1·74	7·44	0·41	0·11
Goondiwindi	0·49	2·62	0·67	1·64	1·09	1·61	1·62	3·37	0·87	2·53	6·49	1·23	0·55
Gympie	0·60	1·11	0·47	0·84	4·08	2·55	3·94	9·75	2·29	2·00	7·05	4·49	0·79
Ipswich	0·23	1·75	0·05	1·56	3·20	1·62	4·25	6·87	1·30	1·85	2·86	1·98	0·50
Laidley	0·32	1·68	Nil	1·87	1·87	3·99	5·26	9·93	2·33	2·17	4·11	2·59	0·56
Maryborough	1·37	0·39	0·46	0·62	3·52	2·62	2·33	20·69	2·67	2·78	3·48	3·56	1·21
Nambour	0·32	1·78	0·59	0·43	1·62	2·08	7·54	13·50	5·38	3·58	6·65	4·79	1·36
Nerang	0·19	1·12	1·22	2·21	3·52	2·39	3·85	4·95	4·99	5·61	8·98	3·63	0·61
Roma	0·20	0·84	0·70	1·22	1·43	0·03	1·76	2·65	1·74	1·44	2·92	1·72	0·21
Stanthorpe	0·68	2·61	0·34	1·85	3·98	1·92	5·00	3·04	0·37	5·29	2·61	1·63	1·01
Tambo	0·28	0·61	0·22	Nil	3·31	0·80	3·90	3·54	1·34	2·54	5·12	0·12	0·06
Taroom	0·54	0·59	0·82	0·05	2·42	1·73	2·92	3·25	1·63	2·73	6·17	2·22	0·33
Tewantin	0·21	1·11	2·20	0·50	1·09	1·93	7·61	11·79	2·91	3·64	12·43	10·01	2·01
Texas	0·70	2·12	0·48	0·81	1·63	0·76	2·97	3·77	0·09	2·47	3·78	3·07	0·80
Toowoomba	0·38	2·58	0·02	2·24	1·61	2·26	2·75	4·50	1·91	4·17	5·27	3·69	0·65
Warwick	0·53	1·98	0·19	2·76	2·89	1·92	3·65	1·52	1·28	6·20	2·06	2·18	0·77
Westbrook	0·22	2·24	0·14	2·29	4·85	3·37	3·65	2·46	0·57	2·00	1·24	2·54	0·46

* Returns not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian: Victorian, 92s. to 93s.; New South Wales, 96s. to 98s.; Queensland, 88s.; New Zealand, 94s. to 96s.; Danish, 110s. to 112s. per cwt.

CHEESE.—Canadian, 53s.; New Zealand, 50s. to 51s. per cwt.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £23 to £24 10s.; raw, £20 to £22 per ton; German beet, 88 per cent., 11s. per cwt.

MOLASSES (duty, 1s. to 2s. per cwt. and ⅛ per cent.).—4s. to 9s. per cwt.

RICE.—Rangoon, £8 to £12; Japan, £12 to £16; Java, £12 to £20; Patna, £10 to £17 per ton.

COFFEE (in bond, duty 1½d. per lb. and ½ per cent.).—Ceylon plantation, 110s. to 125s.; peaberry, 62s. to 120s.; Santos, 37s. to 55s.; Mocha, 56s. to 90s.; Jamaica, 50s. to 120s. per cwt.

Chicory Root, dried (duty paid).—25s. to 27s. per cwt.

Arrowroot.—St. Vincent, 1½d. to 3½d.; Natal, 3d. to 5d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

Wheat.—Duluth, 35s. 6d. per 480 lb.; English, 33s. per 504 lb.; South Australian, 31s. 9d. per 480 lb.; Queensland, 31s. 3d. to 31s. 9d. per 480 lb.

Flour.—29s. 6d. to 32s.; Australian, 24s. to 24s. 3d.

Malting Barley.—33s. to 37s., undressed, 27s. 6d. per 448 lb.

Oats.—18s. to 21s. per 336 lb.; New Zealand, 21s. to 23s. per 384 lb.; Australian, 14s. 9d. to 15s. per 320 lb.

Split Peas.—37s. to 47s. per 504 lb.

Ginger.—Jamaica, 45s. to 55s.; Cochin, 50s. to 65s.; Japan, 16s. to 17s. per cwt.

Vanilla.—4s. 2d. to 10s. per lb.

Pepper.—Capsicums, 14s. to 60s.; chillies, 40s. to 45s. per cwt.; black, 5¾d. to 6d.; white, 7½d. to 7⅝d. per lb.

Green Fruit.—Apples: Australian—Ordinary, 7s. to 10s.; New Yorks, 11s. to 13s. 9d; Cleopatras and Jonathans 11s. to 13s.; Tasmanian, 6s. to 13s. 6d., Coves, 15s. 6d per case; pears, 6s. 6d. to 11s. per tray, and 4s. (damaged) to 28s. per case; Canadian, 20s. to 30s.; Californian, 23s. to 25s. per case; bananas, 7s. to 13s. per bunch; pineapples, 3s. 6d. to 8s. each; oranges, Valencia, per 420, common, 5s. to 8s. 6d.; ordinary, 10s. to 11s. 6d.; medium, 15s. to 17s.; fine selected, 18s. to 22s.; finest selected, 25s. to 41s.; lemons, Messina, per 360, finest selected, 20s. to 25s.; ordinary to fine, 12s. to 16s.

Dates.—Tafilat, 50s. to 56s.; Egyptian, 30s. to 32s. per cwt.; Persian, 9s. to 12s. per case.

Cotton.—Uplands, 4d. to 6d., according to staple and quality; Sea Island, 12½d. to 16½d. per lb.

Cotton Seed.—£5 6s. 3d. to £5 10s. per ton.

Cotton-seed Oil.—Crude, £14 12s. 6d.; refined, £15 15s. to £17 5s. per ton.

Cotton-seed Oil Cake.—£4 10s. to £4 11. 3d. per ton.

Linseed.—38s. to 50s. per 416 lb.

Linseed Oil.—£16 2s. 6d. to £16 5s. per tun (252 gallons).

Linseed Oil Cake.—£7 12s. 6d. to £7 15s. per ton.

Olive Oil.—£33 10s. to £60 per tun (252 gallons).

Copra (cocoanut-kernel).—£14 per ton.

Cocoanut Oil.—£35 per ton.

Honey.—Queensland, 20s.; Jamaica, 22s. 6d.; New Zealand, 32s. 6d. per cwt.

Beeswax.—Australian, £7 to £8 per ton.

Lucerne Seed.—65s. per cwt.

Canary Seed.—65s. to 90s. per quarter.

Manilla Hemp.—£38 10s. to £40 per ton.

Sisal Hemp.—£35 to £36 10s. per ton. The latest shipment of African sisal hemp in the Hamburg market realised £40 1s. 6d. per ton. These prices have ruled for the past six months in the Hamburg market.

New Zealand Hemp.—£26 5s. per ton.

Flax.—£48 to £52 per ton.

Tapioca (duty, 5d. per cwt.).—1d. to 2d. per lb.; pearl, 10s. to 14s. per cwt.; Cassava flour, 5s. to 12s. per cwt.

Eggs.—French, 6s. 9d. to 10s.; Danish, 6s. 9d. to 9s. 3d. per 120.

Bacon.—Irish, 60s. to 68s.; American, 36s. to 44s.; Canadian, 46s. to 56s. per cwt.

Hams.—Irish, 84s. to 96s.; English, 84s. to 100s.; American, 42s. to 47s. per cwt.

Tallow.—Mutton, fine, 28s. 9d.; medium, 25s. 6d.; beef, fine, 26s. 3d.; medium, 24s. per cwt.

Poultry (Smithfield).—Good supplies on offer, but a quiet demand. Quotations:—Fowls (each): Yorkshire, 3s. to 3s. 6d.; Essex, 3s. 6d. to 3s. 9d.; Boston, 2s. 9d. to 3s. 3d.; Surrey, 4s. 3d. to 5s.; Sussex, 3s. 9d. to 4s. 6d.;

Welsh, 2s. 6d. to 3s.; Irish, 2s. 3d. to 2s. 9d.; turkey—cock, 7s. 6d. to 10s.; hen, 5s. to 6s.; geese, 5s. 6d. to 6s. 6d.; Australian rabbits, 7s. 6d. to 11s. per dozen; Guinea fowls, 2s. 6d. to 3s.; wild duck, 1s. 9d. to 2s. each. Queensland poultry sold during May in London: Ducks, 3s 6d. to 3s. 9d.; chickens and capons, 3s. 3d. each; turkeys, 7d. to 9d. per lb.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	July 15.	July 22.
New Zealand Sheep. (Crossbred Wethers and Merino Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$4\frac{1}{2}$d.	$4\frac{1}{2}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{1}{4}$d.	$4\frac{1}{4}$d.
Canterbury, heavy (64 lb. to 72 lb.)	4d.	4d.
Dunedin and Southland (56 lb. to 64 lb.)	None offering.	
North Island (56 lb. to 65 lb.), ordinary	$3\frac{3}{4}$d.	$3\frac{7}{8}$d.
North Island, best	$3\frac{7}{8}$d.	4d.
Australian Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	3d.	3d.
Light (under 50 lb.)	$3\frac{1}{8}$d.	None offering.
River Plate Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{1}{8}$d.	$3\frac{1}{4}$d.
Light (under 50 lb.)	$3\frac{7}{16}$d.	$3\frac{1}{2}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	$5\frac{11}{16}$d.	$5\frac{11}{16}$d.
Canterbury, heavy (36 lb. to 42 lb.)	$5\frac{3}{8}$d.	$5\frac{5}{16}$d.
Dunedin and Southland (28 lb. to 42 lb.)	$5\frac{7}{16}$d.	$5\frac{7}{16}$d.
North Island (28 lb. to 42 lb.) ...	$5\frac{3}{4}$d.	$5\frac{3}{4}$d.
Australian Lambs.		
30 lb. to 40 lb., first quality ...	None offering.	
30 lb. to 40 lb., second quality ...	None offering.	
River Plate Lambs.		
30 lb. to 40 lb.	$4\frac{3}{4}$d.	$4\frac{3}{4}$d.
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{5}{16}$d.	$2\frac{5}{16}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{3}{8}$d.	$3\frac{3}{8}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (160 lb. to 220 lb.) ...	None offering.	
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{3}{16}$d.	$2\frac{3}{16}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$3\frac{1}{4}$d.	$3\frac{1}{4}$d.

QUEENSLAND TIMBER.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the English market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand. Ivory wood should be carefully preserved from destruction.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JULY. Prices.
Apples, Eating, per packer, Victorian (out of season)	6s. to 8s.
Apples, Eating, per packer, Tasmanian	5s. to 6s. 6d.
Apples, Cooking	6s. to 6s. 6d.
Apples, Local	...
Apples, American, Green	...
Apricots, quarter-case	...
Apricots, American, per 108's	...
Bananas, Sugar, per bunch	3d. to $10\frac{1}{2}$d.
Bananas, Cavendish, per bunch	3d. to 1s.
Bananas, per dozen	$1\frac{1}{2}$d.
Cape Gooseberries, quart	...
Cherries, quarter-case	...
Comquats, case	2s.
Custard Apples, quarter-case	2s. to 3s.
Grapes, per lb.	...
Granadillas, case	...
Gooseberries, English	...
Lemons, American, per case	...
Lemons, Local	3s. to 4s. 6d.
Lemons, Italian, per case	...
Lemons, Italian, per 180	...
Loquats, half-gincase	...
Mandarins, Local	3s. to 4s. 6d.
Mandarins, Bowen	...
Mangoes, half-case	...
Mangoes, good, half-case	...
Melons, per dozen	...
Nectarines, quarter-case	...
Oranges, Italian, per 180	...
Oranges, American	...
Oranges, Sydney (packers)	...
Oranges, Local	2s. 6d. to 3s.
Passion Fruit, quarter-case	3s. to 3s. 6d.
Papaw Apples, per case	2s. to 3s.
Peanuts, per lb.	$2\frac{1}{2}$d.
Pears, Victorian, quarter-case	...
Pears, Tasmanian, quarter-case	3s. 9d. to 4s. 6d.
Persimmons, quarter-case	...
Pineapples (rough leaf), per dozen	1s. to 3s.
Pineapples (smooth leaf), per dozen	3s. to 4s.
Plums, Black, quarter-case	...
Plums, Light, quarter-case	...
Plums, American, per 108's	...
Quinces, quarter-case	...
Rosellas, per sugar-bag	...
Tomatoes, quarter-case	1s. to 1s. 6d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JULY.

Article.		JULY. Prices.
Bacon (Pineapple)	lb.	5½d. to 7½d.
Barley, Malting	bush.	3s. to 3s. 3d.
Bran	ton	£4 5s. to £4 10s.
Butter, Factory	lb.	9d. to 11d.
Chaff, Mixed	ton	£2 15s. to £3.
Chaff, Oaten	,,	£3 to £4 10s.
Chaff, Lucerne	,,	£3 to £3 7s. 6d.
Chaff, Wheaten	,,	£2 5s. to £3.
Cheese	lb.	6½d. to 7½d.
Flour	ton	£8 to £8 10s.
Hay, Oaten	,,	£4 17s. 6d. to £5.
Hay, Lucerne	,,	£2 5s. to £2 15s.
Honey	lb.	1d. to 1½d.
Maize	bush.	1s. 11d. to 2s. 6d.
Oats	,,	2s. to 4s. 3d.
Pollard	ton	£4 10s. to £5.
Potatoes	,,	£4 15s. to £7 10s.
Potatoes, Sweet	,,	£1 to £1 15s.
Pumpkins	,,	15s. to £1 10s.
Wheat, Milling	bush.	2s. 10d. to 3s. 5d.
Wheat, Chick	,,	2s. 6d. to 3s.
Onions	ton	£11 15s. to £15 10s.
Hams	lb.	8½d. to 9½d.
Eggs	doz.	7½d. to 1s. 2d.
Fowls	pair	1s. 6d. to 3s. 9d.
Geese	,,	3s. 6d. to 5s.
Ducks, English	,,	2s. to 3s. 9d.
Ducks, Muscovy	,,	2s. 6d. to 4s. 6d.
Turkeys, Hens	,,	4s. to 6s.
Turkeys, Gobblers	,,	6s. to 11s.

ENOGGERA SALES.

Animal.	MAY. Prices.	JUNE. Prices.
Bullocks, Extra Prime	...	£9 17s. 6d. to £11 10s.
Bullocks	£8 2s. 6d. to £9 17s. 6d.	£7 10s. to £8 10s.
Cows	£6 7s. 6d. to £7 2s. 6d.	£4 15s. to £8.
Merino Wethers	20s. 9d.	19s. 9d.
,, Ewes	16s. 6d.	16s. 3d.
C.B. Wethers	24s. 6d.	24s. 6d.
,, Ewes	18s. 9d.	18s. 9d.
Shropshire Wethers	19s.	...
Lambs	16s.	15s. 6d.
Pigs, Baconers	30s.	33s. 6d.
,, Porkers	26s. 6d.	26s. 6d.
,, Slips	4s.	3s. to 5s. 9d.

Orchard Notes for August.

By ALBERT H. BENSON.

The planting of deciduous trees should be completed by the end of this month in all parts of the State, but evergreen trees can be transplanted during seasonable moist weather at any time of the year if the operation is carefully carried out. When set out, the young trees must be cut hard back to a height that in no case should exceed 2 feet from the ground, and in warm dry districts half of this height is to be preferred. Cutting back at planting insures a strong and vigorous young growth, whereas by neglecting to cut hard back at planting the future growth, vigour, and symmetry of the tree are greatly impaired if not completely spoilt. The pruning of all deciduous trees must also have been completed; and all citrus fruit trees from which the fruits have or should have been gathered should be gone over carefully, all dead and badly diseased wood should be removed, and any crossing or superfluous branches, or water sprouts, should be cut away. When the trees are badly attacked by scales, this pruning should be severe, in order that the remedies used for dealing with these pests may have a fair chance, as when the top of a citrus tree is allowed to grow like a mat it is impossible to get the spraying material on to the parts where it is most wanted. Spraying should be systematically carried out in every orchard in the State during this and the preceding month, and in the case of fungus diseases on deciduous trees during the following month as well. Spraying is just as essential an operation as the gathering of the fruit; and no fruit-grower who wishes to make fruit-growing a success can afford to neglect it, as it is impossible to breed disease in fruit trees and to grow fruit profitably at one and the same time. A full description of the operation of spraying and of the most approved remedies was published some time ago in pamphlet form by the Department of Agriculture, so that any grower who has not received a copy and who desires to obtain the necessary information may obtain it by writing to the Department. After pruning and spraying, the orchard should be ploughed; so that all weeds and trash can be buried, and also that the land that has been trodden down firm shall be broken up. Use a short American plough that will take a wide furrow and turn it right over. The depth at which to plough will depend on the treatment the orchard has previously received and on the nature of the soil. If the soil is shallow, or if the land has never been worked, then the ploughing must be shallow or the roots will be badly injured; but where there is plenty of soil and a perfect subdrainage, then the ploughing can be from 4 to 6 inches in depth (provided the land has been previously cultivated) without any injury to the trees. In fact, in such soil surface roots are not required, and the trees stand dry weather best when deeply rooted.

Quick-acting artificial manures, such as sulphate of ammonia, sulphate of potash, or superphosphate, can be applied during the month, but care should be taken not to apply too large a quantity at once, as, owing to their extreme solubility, a considerable portion of them is apt to be washed out and lost by heavy rains. In conclusion, one more word about spraying, and that is: Do your utmost to stamp out diseases in new districts as soon as ever they make their appearance. Do not consider any disease too trivial, and that it can be well let alone to a more convenient time, as the more convenient time will not come; but the disease will flourish and spread rapidly, so that what might have been checked, if not eradicated, by half an hour's work will now take the grower all he knows to get the better of it. In spraying, whether for insects or fungi, a knowledge of the pest to be treated, combined with carefulness and promptitude, are the essentials of success.

In notes of this kind it is impossible that they can apply equally to every part of the State, but they will be found to be about an average. Very early districts will sometimes require the notes of a month later, and very late districts those of a month earlier.

Farm and Garden Notes for August.

This and the following two months are about the busiest periods of the year so far as work in the field is concerned; and the more activity now displayed in getting in the summer crops, the richer will be the reward at harvest time. Potatoes should be planted, taking care to select only good sound seed that has sprouted. This will ensure an even crop. Yams, arrowroot, ginger, sisal hemp, and sugar-cane may now be planted. Sow maize for an early crop, choosing the largest and flattest grains. If the seed of prolific varieties is regularly saved, in the end it will not be surprising to find from four to six cobs on each stalk. This has been the experience in America, where the selecting of seeds has been reduced to a fine art. Swede turnips, clover, and lucerne may be sown, but as the weeds will soon dispute the ground with the crops keep the hoe and cultivator constantly going. Sow tobacco. Rice and coffee (except Liberian) should be by this time harvested. August is usually a dry month, especially in the North. Plough out the old canes, and get the land in order for replanting.

Kitchen Garden.—Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnip, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg plant, sea kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

Flower Garden.—All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragon), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, cockscombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2·63 inches, and for September 2·07 inches, increasing gradually to a rainfall of 7·69 inches in February.

Farm and Garden Notes for September.

Field.—Spring time has now arrived, and with it there will be the usual trouble with weeds, especially on carelessly cultivated land. Therefore, the cultivator, the hoe—horse or hand—must be kept vigorously at work to check the weed pests and save the growing crops and much future labour. Attend to earthing up any crops which may require it. There may possibly occur

drying winds and dry weather; still good showers may be looked for in October, and much useful work may be done during the present month which will afford a fair prospect of a return for labour. Plant out *Agave rigida, var. sisalana* (sisal hemp plant), in rows 8 feet apart each way on rich soil, or 7 feet by 7 feet on poor lands. All *dry* places on the farm too rocky or poor for ordinary crops should be planted with this valuable aloe. If the soil is very poor and the plants very small, it is better to put the small plants out in a nursery of good soil, about 2 feet apart. Next year they will be good-sized plants. Keep down tall weeds in the plantation, and do not allow couch grass to grow round the roots. The Agave will do no good if planted in low, wet land or on a purely sandy soil. It thrives best where there is plenty of lime, potash, and phosphoric acid, all of which can be cheaply supplied if wanting in the soil. Sow maize, sorghum, imphee, prairie grass, panicum, tobacco, and pumpkins. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, earth or pea nuts, arrowroot, turmeric, ginger, and canaigre (bulb yielding a valuable tanning substance). Plant out coffee.

Kitchen Garden.—Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing most kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost, dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and stir the soil in the latter case early next day to prevent caking. Mulching with straw or leaves or litter will be of great benefit as the season gets hotter. It is a good thing to apply a little salt to newly-dug beds. It is not exactly known what the action of salt is on the soil, but when it is applied as a top-dressing it tends to check rank growth. A little is excellent for cabbages, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 feet apart and 18 inches between the plants, and the climbing sorts 6 feet each way. Sow cucumbers, melons, marrows, and squashes at once. If they are troubled by the beetle, spray with Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 feet apart. Plant out tomatoes 3½ feet each way, and train them to a single stem either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinach, vegetable marrows, custard marrows, lettuce, parsnips, carrots, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory, provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

Flower Garden.—Continue to plant bulbs as directed last month. Protect the plants as much as possible from cold westerly winds, which may still occur, notwithstanding the increasing temperature. Keep a good lookout for slugs. Plant out chrysanthemums, palms, and all kinds of tropical and semi-tropical plants. If hot weather should ensue after planting, water and shade must be given. Sow dianthus, snapdragon, coleus. Roses will now be in full bloom. Keep them free from aphis, and cut off all spent blooms. This latter work should be done in the case of all flowers. If you wish to save seeds, do not wait for the very last blooms, but allow some of the very best to go to seed. If you have any toads in the garden or bush-house, be careful not to destroy them, but encourage them to take up their abode there. They are perfectly harmless in spite of their ugliness, and they destroy an astonishing number of insects injurious to plants. Fill up all vacancies with herbaceous plants. Sow zinnia, galliardia, amaranthus, cockscomb, balsam, sunflower, marigold, cosmos, summer chrysanthemum, coreopsis, portulacca, mesembryanthum, calendula, &c.

Agriculture.

OUR NATIVE GRASSES AND HERBAGE.

By H. C. QUODLING, Inspector of Agriculture.

Queensland has, like the remaining States in the Commonwealth, been a very large exporter of raw products, brought about, in the first place, by the undoubted richness and variety of its pastures; and, secondly, because of its geographical position and want of population.

Where would our natural wealth be but for the unlimited supply of pasture, admitting of carrying such immense numbers of stock, and yet how little seems to be done in a systematic way to allow of reseeding and recouping exhausted areas?

A great deal of money and time has been devoted to introducing grasses from other countries, but, with the exception of districts where the soil conditions were very favourable and the climate equally so, the results have not been all that could be desired. This applies, perhaps, in a greater degree to grasses from temperate countries than to those from subtropical or tropical regions.

The law of natural selection and adaptation of species has been going on for centuries, and it seems unreasonable to suppose that man can accomplish in the space of a few years that which Nature has taken so long to do. Exceptions do occur where exotic grasses and clovers have found a congenial home and are flourishing apace, but these, in their native countries, were once in as neglected a state as our own, and have been improved by systematic cultivation.

It is a thoroughly established fact that Australian grasses and herbage rank second to none when compared with those of other countries, and the phenomenal value and quality of raw products derivable from this one source point clearly to the indisputable fact that their nutritive qualities are undeniable. Contrast the conditions existing between a well-stocked run, away from the influence of the coastal ranges, with those of one within its influence. The former position, with its more meagre and precarious rainfall, sometimes suffers from a dry spell. This may occur at the natural seeding time, but plants have to battle on, with very little chance of developing when all their natural functions are active; and even those plants which are able to throw out seed and reproduce themselves have been stinted and stunted by continuous grazing.

On the other hand, with the advance of settlement and increase of stock in the vicinity of big centres, graziers, and more particularly dairymen, have been compelled to look round for a means of maintaining their stock in an efficient state throughout the winter and early spring, and have turned their attention to such friends as "paspalum" and "prairie," for the reception of which land in the generality of cases has been cultivated or carefully prepared. But far from these favoured climates with their more regular seasons a different state of affairs exists. These grasses throw back to old "Dame Nature," perhaps for the simple reason that she has much of her own which requires taking in hand.

Observe the perennial grasses with their tufty growth and deep root systems thickened and abnormally developed, which enable them to survive dry periods. The very arrangement of the tufts of grass with intervening bare patches of earth is a striking feature of Nature's wisdom. Wait till a favourable season occurs, and then what a transformation! These patches, which to the uninitiated seem waste ground, are soon transformed and covered with a thick mass of herbage, which lives to fulfil its mission, seed, and die. It is an oft-repeated expression which one hears, "That the country doesn't fatten like it used to"—"That the wire and spear grasses are getting bad"; and that "roly-poly," *Salsola kali*, or some other objectionable plants are taking possession of the land.

In many instances this is the result of heavy stocking, principally with sheep, and the eating out of the best and most palatable grasses. Horses also are severe on country, but consume more of the harsher and injurious seed-bearing grasses than sheep; whilst it may be stated that cattle, in limited numbers, are of assistance in sheep country to consume the roughage. Excessive grazing is not always to blame for the reduced carrying capacity of land, as many influences, climatic and otherwise, prevail which have a distinct prejudicial effect.

Our natural and much of our national wealth is derivable from our pastures and herbage, and it seems a Herculean task to take large areas in hand on account of the expense; but, when the immense losses which stockowners have to put up with at certain periods are taken into consideration, it is well to consider whether something cannot be done to make use of the material at hand, and that of the very best suited for the purpose.

There are upwards of 350 species of grasses indigenous to Australia, not all of which may be termed of value as fodder, but when the drought-enduring order of Chenopodiaceæ, to which our saltbushes belong, is added, and the merits of the numerous edible shrubs are fully appreciated as adjuncts, and sometimes as the only means, in many cases, of tiding stock over dry, grassless periods, there is a wide field offered for careful and systematic action in encouraging and preserving indigenous grasses and fodders. The means employed to improve the carrying capacity of land vary so much with the local and virgin conditions that it is proposed here only to generalise on the principal means to that end.

Where there is an excess of timber, ringbarking or sapping goes a long way toward sweetening up country, and permits the natural grasses to develop; but shelter belts or breaks, shady clumps, and sound, straight trees for future building and fencing purposes should be preserved, not only from an economic standpoint, but for the value and importance that forest trees possess in influencing the climate and rainfall. This is specially noticeable where trees have been planted on exposed and naturally treeless districts as natural fire breaks, shelter clumps, or possibly for reafforestation purposes. The possession of this description of shelter is no mean factor in the keeping of stock. While advocating judicious ringbarking, it is to be borne in mind that edible scrubs play a most important part in grassless periods, and to clean these out of existence would be an almost criminal act.

In many localities burning off was and still is practised, but while it is a distinct advantage in some cases it acts very often in a contrary manner.

The value of fresh green feed for lambing ewes and their progeny is fully recognised, particularly when by burning off there is an additional object to be gained by ridding pastures of the chances of infection from any contagious disease.

Where seedy, strong tussocky, or blady grass patches occur, they may be burnt with advantage, but when weighed in the balance there is, as a general rule, a distinct loss of valuable seed, herbage, and humus-forming material, which with the coating of grass forms a natural mulch.

Some classes of country are notably slow in recovering after being burnt off. It is a regrettable circumstance, but nevertheless true, that much of the Chenopodiaceous herbage has become depleted.

Pastoralists in other countries have recognised the value of the Australian saltbush when grown on arid and alkali-impregnated country; and yet why do we as a community fail to appreciate its advantages? Much could be accomplished by systematic effort to re-establish and preserve our heritage.

Local conditions will dictate the best methods of reproduction, but it is safe to assume that when paddocks are subdivided and a particular area is rested at the critical seeding time, during a system of rotation in grazing, there is more possibility of attaining the desired result. This applies not only to the various species of herbage, but to the Graminaceæ; and it is from these

"preserved" areas that fully developed seed may be collected also, for the purpose of establishing nurseries on other portions of the grazing area.

Facilities exist on most properties for ploughing and disking land and bringing it into tilth, and when strips or patches are prepared in favourable portions of a paddock, and then sown down with seed of the species it is desired to perpetuate, these areas will form the nuclei for propagating and disseminating the resulting increase.

Well-established strips of strong-growing varieties of saltbush are not to be despised for checking grass fires.

In conclusion, I would earnestly impress on those who read this article that any individual who fosters and helps to preserve our birthright is nothing less than a public benefactor.

Those who have witnessed distressed and starving stock in a time of drought literally licking up the only means of existence—namely, the "blow-about" stems of grasses—will appreciate the plea for our four-footed friends to increase the means and variety for their subsistence; and last, but not least, I would appeal to dairymen and stockowners generally, and would emphasise the need for conserving as much of the natural grasses as possible; cut, stack, and, if possible, thatch not only for a rainy day, but for the ever-recurring nightmare, "drought."

NATURE STUDY AND ITS AGRICULTURAL PHASE FOR STATE SCHOOLS IN QUEENSLAND.

By HOWARD NEWPORT, F.R.H.S

As a result of the agitation to have some attention paid in our State school curriculum to the instruction of, or perhaps it would be nearer the spirit of the idea to say fostering the natural interest of the pupils (by direct observation) in, the science and practice of agriculture, or, in other words, Nature Study in its Agricultural Phase, the Educational Department has duly included this among the subjects of the ordinary course for certain classes.

The most recent syllabus reads as follows:—"For Classes V. and VI., a course of experimental lessons in a branch of elementary science—or lessons bearing on agricultural pursuits, dealing not merely with agricultural operations with which the pupils may be already familiar, but with such scientific principles as will enable them to understand the reasons for the operations of the farm or orchard, and to appreciate the literature which is intended for the benefit of agriculturists. Collecting specimens of natural history, or—lessons bearing on the principles involved in the various processes of local industries."

The drawing up of this has, no doubt, been largely moulded by the repeated expression of opinion by the Department of Agriculture and Stock, the writings of the editor of and contributors to the *Queensland Agricultural Journal*, and the statements of champions of the scheme, such as Mr. F. W. Peek, whose suggestion, made as far back as 1901—that "A syllabus be drawn up for each course, and it can be left in the teachers' hands to modify it in the most suitable manner for local requirements"—has very evidently been borne in mind by the educational authorities responsible for the wording of this syllabus, for the syllabus does indeed leave a very considerable scope in the hands of the teachers for modification and adaptation to local requirements. The subject is so vast in its various branches and the directions so vague that it is not surprising that teachers, more especially in the rural schools, anxious to carry out in full the obviously good intentions of the Department, should hesitate as to where to begin, and how—what branch to take up, and how to follow it up. Having received several letters of inquiry for advice and information from State school teachers so situated here in the North, it is with a view of offering suggestions for the carrying out of the regulations, and

consisting principally of an amplification of the existing syllabus and suggestions as to text-books, that this paper is offered. The idea permeating the whole scheme, and which may be clearly read between the lines, is that the simple scientific principles underlying the natural cause and effect of agricultural operations should be explained to children in such a way as to catch and hold their attention (as by appealing to their sight and reasoning powers by means of object lessons and experiments), so that they may gain and retain such knowledge naturally and without any heavy effort of memory. An American professor, in speaking on agricultural teaching in public schools in America, said:—"It is as practical to teach children the character of soils, of plant life and growth, and to equip for the illustration of these, as to teach and equip for illustrating the mechanical trades or domestic arts." It might be added that, in an essentially rural district, where the majority of the children may be expected to settle to agricultural pursuits, it is eminently more practical and useful. At the same time, however, the remarks of the Minister for Agriculture must be borne in mind when he says:—"To avoid the error made by French schools, instruction should be addressed less to memory than to the intelligence of the children, and they not be compelled to learn a list of definitions, precepts, or agricultural receipts." It is obvious that the success or failure of the scheme depends upon the manner of teaching, the local interest of the subjects chosen, and the skill with which the objects are selected, as much as on the individual capabilities of the teacher. In other words, a careful choice of subjects and a thoughtful selection of simple experiments or objects will more than compensate for a want of even average technical knowledge on the part of the teacher (a knowledge that could in many instances be scarcely expected of those whose time has been devoted more or less exclusively to book work), and go further towards success than even expert scientific knowledge on the part of the instructor. Advanced scientific knowledge is able to display and prove its advantage to the State, and has greater scope for so doing, in colleges and lecture halls, and demands, moreover, a certain amount of ground work and knowledge of accepted facts or formulæ on the part of pupils and students, which, in teaching the very young, the scientist or expert is perhaps more apt to forget do not exist, and he takes more for granted than the less expert scientist, but still capable teacher of children. Under such circumstances, the undoubtedly clever and admittedly scientifically valuable lecture or paper would prove either wholly or partially unintelligible, and, therefore, uninteresting; while some lasting and permanently acquired knowledge, although little and simple, would be attained, were the teacher less scientific and put in the position of senior pupil and a co-learner, for, with the children, it is "not technical education in the science and practice of agriculture," but rather the directing of the young mind to the study of Nature that is required and aimed at.

With this in view, therefore, let us analyse the syllabus. This may be divided into four main headings:—

Lessons on—(1) Elementary Science.
(2) Agricultural Pursuits.
(3) Collection of Natural History Specimens.
(4) Local Industries.

The first heading—Science—is a vast subject in itself, and may embrace anything from astronomy to ethnology, and nearly all the 'ologies between or beyond.

Science is simply knowledge, or, as the dictionary has it, "penetrating and comprehensive information," and "Science" here is not qualified in any way, except by the expression "elementary," which reduces tne quality rather than the quantity of the items covered by the term. This is certainly comprehensive, and there can be no cavil as to scope or choice left open in the hands of the teachers for modification.

Agriculture becomes but a small moiety of so capacious a theme, and, as it is especially of the agricultural or horticultural aspect that I wish to speak, we may leave this first alternative.

In the last alternative also (No. 4), while agriculture and the allied subjects are included, there is nothing confining the lessons to such, or prohibiting the inclusion of lessons on the principles involved in, say, the processes of shoe-making or mining.

Regarding the collection of natural history objects or specimens, this being the easiest, is, I think, in many if not in most instances readily taken up; and where such objects are displayed in the schoolroom the collection becomes not only a source of interest and information, but proves an incentive to emulation among the pupils to add to it; and these collections also animate and stimulate the natural powers of observation of Nature in the children in the true spirit of the scheme.

A very interesting and always presentable collection of such things as seed, berries, small fruits, minerals, and even insects, &c., can be got together in small bottles readily obtainable from most chemists at small cost. These bottles stand about 3 inches high, nearly 2 inches in diameter, have wide necks, and screw metal tops which can be made air-tight. They hold about 3 oz. of liquid, and are commonly used by chemists for putting up pomades or ointments. I have known quite a number of such bottles collected by the simple means of asking the children to look out for such when thrown away at home, and collect and bring them to school. Such little bottles, carefully cleaned and dried, for seeds, soils, ores, &c., and neatly labelled with the common name, the scientific name, the natural order or family, the locality, and donor, being of uniform size, are not only attractive, but handy, readily examined, and occupy very little room. For such specimens as berries, insects, or even small reptiles, a bottle of formalin should be kept handy. This costs only about 1s. 6d., and when a specimen is procured and put into a bottle it may be filled to nine-tenths of its capacity with clean, clear water and one-tenth of formalin; and when the lid is screwed tightly down, the specimen will keep satisfactorily for an indefinite period. There are certain specimens that need more or less formalin to satisfactorily preserve, but for general purposes this will be found sufficient and useful. For dried specimens, such as ferns, pressed leaves or flowers, fibres, grasses, &c., ordinary glazed picture-frames are preferable; and for minerals or miscellaneous objects, glass cases will be necessary; but these are more expensive, and a call upon the funds available by the school committee will be necessary. Until such museum has attained some dimensions, however, a glass-fronted cupboard on the wall of the school will be found ample accommodation for it.

The second alternative—dealing as it does essentially with agricultural matters—claims most attention. This also is somewhat vague, and leaves ample scope for selection, judgment, and inclination on the part of the teacher. Which of the many subheadings that can be found under this title shall be chosen, is a question not easily answered and one that it would be invidious to attempt to answer. The success and enhanced interest taken by the scholars in the matter, or its flat failure and their dull and listless indifference, depends upon this choice; and it must be guided, therefore, by local conditions, any special direction that the inclination of the children may indicate, the suitability or attractiveness of the material to hand for the object lessons, and many other things.

From the point of view of the teacher, it is always advisable, if at all possible (and presuming the teacher is not already a natural scientist), to look up in some text-book, even if nothing more specific than the Encyclopedia Britannica is available, the subject to be taken up in each lesson, not so much with the object of retailing second-hand information as to get hints or points of conditions, distinguishing characteristics, features, causes, or effects to be rediscovered during the lesson on the object under inspection; also to be

prepared for questions, for no matter how the teacher may endeavour to place him or herself in the position of co-learner and chief pupil, rather than that of lecturer or expert expounder, neither can avoid that instinctive idea in the minds of the children that "teacher" is able to answer readily any question and unravel dexterously any knotty point that may occur to them.

This opens the question as to what text-books are necessary and advisable. None, I believe, have so far been especially named by the Department. For elementary botany, I do not think a better book could be found than "Australian Botany," by Guilfoyle. This is terse and simple, and, although not written for Queensland or the North, is essentially Australian, and primarily intended for the use of schools. This is published by Geo. Robertson, of Melbourne, Sydney, and Brisbane. For agriculture in general the book *par excellence*, being especially written for Queensland, would be "First Steps in Agriculture," by A. J. Boyd; but whether this is yet published in book form, I cannot say. It appeared in a series of articles in the *Agricultural Journal*, commencing in April, 1901. Tanner's "First Principles of Agriculture" is also good and useful; and Stephens' "Book of the Farm," published by Blackwood and Co., London, would be suitable, but is somewhat more expensive than the others. "Agriculture," by K. Hedger Wallace, published by W. and R. Chambers, London, price 3s., deals with the more important facts of chemistry and physics, and applies them to practical farming.

Covering natural science, and including also elementary botany, is "Nature Teaching," by F. Watts and W. G. Freeman (Murray, London, 3s. 6d.), which is especially intended for schools. For the teachers, "House, Garden, and Field—a Collection of Short Nature Studies," by L. E. Miall (Arnold, London, 6s.), is not only useful and instructive, but most interesting. "Pictorial Practical Gardening," by W. P. Wright (Cassell, London, 1s.), is cheap and worth having as a book of guidance for the working of the school garden plot, albeit the matters dealt with are more suited for the temperate than the tropical portions of the State.

In soils—Munro's "Soils and Manures" (Cassell, London, 2s. 6d.) is most useful as a book from which the teacher can make up his lessons rather than a text-book for direct teaching, except for advanced students. Aikman's "Manures and Manuring" (Blackwood, London) is more expensive, but up to date. This is also advanced, but concise. It deals with soils and their nature, as well as manures and manuring.

The books that deal with this vast subject are legion. Those mentioned, except the "Book of the Farm" and "First Steps in Agriculture," do not touch on such allied subjects as dairying, stock, &c.

The subjects or group of subjects that may be chosen for lessons are innumerable. For successful following up, systematisation is essential. There is no doubt that a subject in which knowledge is necessary to success in agricultural pursuits, is essential as a foundation to subsequent teaching and lessons, and in which ignorance is regrettably often evident in farming districts, especially in the North, is that of *Soils*. I would suggest as subjects for lessons under this heading:—How soils are formed; Local soils; Alluvial soils; Rock soils; Sand, Clay, Humus, &c.; Subsoils; What constitutes fertility; Physical properties of soils; Effect of rain, sun, and weather on soils; Chemical composition of soils; Retentive power; Absorptive power; Influence of colour; Gases in the soil; Biological properties; Fertilising bacteria, &c. Interesting objects for object lessons, little and easily arranged experiments, such as the determination of properties of clay, sand, humus, &c., in soils, the absorptive power of soils, &c., can be readily carried out; and the museum added to in the direction of specimens of local soils, sands, coloured clays, stones, and rocks found in the vicinity.

This subject naturally leads up to the growth of *Crops*, and the lessons might be—The effect of growing crops; Plant constituents, Nitrogen; Drainage, its necessity, objects, and methods; Soil foods and air foods; Root crops;

Cereal crops; Annual and perennial crops; Rotation of crops; Fodder crops; Pasturage; Auxiliary crops; Catch crops; Crops that might be profitably grown; Orchards in relation to farms; Waste land on farms; Exhaustion of soils, &c. In this the experiments would be with plants in pots in ordinary soil, pure sand, &c., illustrating the cause and effects of watering and drought, drainage, &c. The objects consist of samples of various crops, &c.; and the additions to the museum would lie in the direction of collections of cereals, grasses, seeds, &c.

This would again lead on to *Manuring*, a subject of equal importance, the inculcation of the elementary principles of which could not be otherwise than beneficial to the country. As lessons under this heading may be suggested—Objects, reasons, and necessity for manuring; Principles of manuring; Functions performed by manures; Different classes of manures; Nitrification; Farmyard manures; Compost manures; Artificial or chemical manures; Lime, bones, guano, &c.; Method of application; Times and seasons for manuring; Green manures, &c. The experiments here would lie both in the garden plot and in pots or boxes in the veranda, when the comparative effects of certain manures may be noted, of course not scientifically accurately perhaps, but enough to show a difference and a contrast. The museum may benefit by samples of such manures which, in small samples of 1 lb. or so, could be obtained from meatworks, seedsmen, or the Department of Agriculture, and be sufficient both for the experiments and the museum bottle.

Under the heading of *Field Work* would fall such subjects as Ploughing, Subsoiling, Trenching, Forking, Harrowing, Scarifying, Chipping, Sowing or Drilling seed, Reaping, Scything, Hay-making, Harvesting of different crops, Fruit-gathering, Grading of produce, Packing, &c. It must be remembered in this, however, that it is not the mere operation that is to be described, but the principles involved or the necessity, reasons for, and objects of such. Where there are different methods of field operations in vogue, it might be advisable to illustrate or describe them in some detail, as, for instance, in ploughing, when the different styles of furrows, &c., might be shown on the blackboard. The experiments of this heading would come rather within the operations of the school garden, and the objects consist of various specimens of tools borrowed from the ironmonger, such as spades, hoes, forks, &c., or of machinery inspected at a farmstead, while their different uses and the objects of each could be explained.

Under *General Farm Subjects*, interesting as well as instructive lessons could be given on Stock, Horses, Cattle, Pigs, Poultry, touching on the principal breeds, their main characteristics, and the general advantages of good varieties over the nondescript; Housing of stock, Stables, Piggeries, Fowlhouses, Barns, Silos, Farm implements and Machinery and the care of them; Drays, Wagons, Fences, &c.

To go more into *Horticulture*, in this branch, perhaps, examples will be more to hand and objects more readily obtained, illustrating Fruit culture, Oranges, Mandarins, Pines, Bananas, Mangoes, &c., and the more uncommon fruits that might with profit or advantage be cultivated, such as Breadfruit, Litchii, and Avacado Pear, &c.; Pruning, Budding, and Grafting; Treatment for plant diseases and pests also may be suggested.

Vegetable-gardening also is easy of illustration, and the variety of vegetables about which there is plenty to learn is large, and the times, seasons, and work necessary for successful market-gardening give scope for an interesting, necessary, and valuable course of simple object lessons.

In the subjects for lessons mentioned, the simplest and most understandable title has not been given or looked for here. The subject is suggested to the teacher merely as a subject in the amplification of which he will, no doubt, be able to find a simple title that would be readily understood by his pupils at the same time as descriptive of the subject.

Simple experiments in soils and manures, requiring very little apparatus or preparation, and which can be easily copied, will be found described in the books mentioned. The list of items as separate subjects for lessons might be indefinitely extended; but these will serve to show the enormous area covered by the few words of the syllabus, and also, I hope, be of some assistance to teachers, should they elect to take up Nature Study in its Agricultural Phase, in deciding what group of subjects to choose, and illustrate how one lesson may be made the foundation of the next, the interest in the whole be probably maintained, and practical good result, that would not be possible without systematisation and were the lessons disconnected and without relation to each other.

Finally, regarding the classification of the groups themselves and their adaptation to the classes to be taught, it may be worth requoting from the Year Book of the Agricultural Department of the United States for the year 1900, where the agricultural instruction in primary schools of France is given as follows:—

Elementary Primary Instruction.

Elementary Course (Pupils 7 to 9 years old).—First lessons in the garden and school.

Middle Course (Pupils 9 to 11 years old).—Ideas appropriate to what the child has read; object lessons and excursions for the purpose of familiarising pupils with soils, fertilisers, tillage, and common implements.

Higher Course (Pupils 11 to 13 years old).—More methodical instruction on tillage, implements, drainage, fertilisers of all kinds, sowing, harvesting, domestic animals, and book-keeping; ideas about horticultural propagation, tree culture, and grafting.

Superior Primary Instruction.

Advanced Courses for Boys and Girls over 13 years old.—Practical ideas about vegetation, the duration of growth, and reproduction (by seeds, buds, and grafts); different kinds of lands, manures, and their use and rotation; the use of agricultural implements and machines; principal operations in agriculture, such as breaking up land, planting, transplanting, drainage, and irrigation; principal crops of the locality; diseases of plants, parasites; legumes, fruits, flowers; training and pruning fruit trees; care of domestic animals, bee culture.

FORMALIN AND SEED WHEAT.

The effect of the formalin treatment of seed wheat is a matter of considerable importance to farmers, and, acting on complaints that it had been found to interfere seriously with germination, the Victorian Director of Agriculture (Dr. Cherry) has collected information of results from a large number of experimentalists. The director points out that the action of formalin, bluestone, or any other solution used to kill the spores of smut always has the effect of interfering with germination in cases where the wheat meets with a spell of dry weather, but the reports to hand show that where germination does take place quickly the formalin-treated wheat is decidedly in advance of the untreated wheat beside it. This result, he says, is very noticeable this year in the Nhill district. If germination has been long delayed, on the other hand, the formalin, like bluestone, has the effect of preventing a considerable proportion of the seed germinating at all, and farmers who have had experience of bluestone know that it is occasionally necessary to replant the paddock. The tabulated results of preliminary trials conducted by the department indicate that the germination results depend upon the quantity of formalin

used, and that, while with a solution of 1 lb. in 40 gallons of water they are practically the same as with untreated wheat, there is a reduction in the proportion germinated as the quantity of formalin is increased. This becomes very marked where 2½ lb. and 3 lb. was mixed with 40 gallons of water, more particularly where the germination took place within two or three days. The following table gives the results of the number of seeds germinated per 1,000 in from two to nine days of wheat untreated or treated with solutions varying in strength from 1 lb. to 3 lb. of formalin to 40 gallons of water:—

	Germinated per 1,000.				
	2 Days.	3 Days.	5 Days.	6 Days.	9 Days.
Untreated	830	917	944	946	969
1 lb.	827	908	940	948	964
1½ lb.	798	893	930	944	963
2 lb.	714	660	936	948	960
2½ lb.	514	717	915	932	...
3 lb.	480	638	749	771	786

In the leaflet issued for the past sowing season 1 lb. in 40 gallons was given as the right proportion to use.—*Station, Farm, and Dairy.*

PASPALUM DILATATUM.

Mr. A. J. Macdonald, of Strathranald, Proserpine, writes on this subject as follows:—

As you have always taken a great interest in the spread of *Paspalum dilatatum* grass in this State, perhaps the following few facts may prove of interest to yourself and that large body of selectors who have so recently settled along the coast-line in tropical North Queensland.

As you are doubtless aware, the most of our lands on the coast are a mixture of scrub lands and blady grass plains.

The blady grass, although it grows so luxuriantly, is, unfortunately, of a very poor quality for dairying or, in fact, any stock purposes.

Last March, despite a great deal of adverse criticism, I sowed broadcast about ¾-lb. of *Paspalum dilatatum* seed in a 3-acre fenced paddock. In this paddock there were patches of long blady grass, couch grass, and swamp grass, and the paddock had from thirty to forty poplar gum-trees growing in it.

The seed lay nearly two months before it came up, and then it came with a rush. The first places to show signs were bare patches of ground where logs had been burned off, but very soon afterwards it was noticed growing just as strongly amongst all the other grasses. The swampy grass goes dead and rotten wherever the paspalum comes up. During the two months that the seed lay dormant about 50 inches of rain fell.

This result proves that in the rainy coast districts of North Queensland there is not the slightest need to go in for the laborious system of grubbing and ploughing when equal results can be obtained by broadcast sowing.

I have thought, since seeing these thousands of stools coming up from simply ¾-lb. of seed, that these facts, being known and proved widely, would go a long way towards settling the vexed question of closer settlement in the North. I contend that I have proved conclusively that, by sowing paspalum seed in March, and in May running stock on it, the blady grass can be got rid of and replaced by a grass at least fifty times its value.

I bought my seed in Brisbane, as more likely to be acclimatised than that obtainable in the Southern States, and I let the January and February rains pass by without sowing, through fear of the scorching power of the sun. I cannot say whether this was necessary. The following gentlemen, who reside on Proserpine, are all of the opinion that the method is a success here, and has come to stay:—Rev. A. H. Macdonald, F.R.G.S.; Mr. A. S. M. A. Banks, who

was delegate from Proserpine to the White Cane-growers' Conference at Townsville; and Mr. James Morrison, who has had a long experience in the dairying industry.

Farmers should be very careful not to sow the seed near their cane cultivation, or the effects might be disastrous. I dropped a few seeds in the Rev. Mr. Macdonald's pineapple patch, and I am receiving the clerical anathema ever since. He has gone down 2 feet after the roots, but has not got to the bottom of them.

I hope I have made sufficiently clear that I neither grubbed nor ploughed nor in any way disturbed the soil, but just scattered the seed as thinly as possible amongst the existing grasses.

If this plant were widely adopted, there would be no need in drought-time for the Western sheep to travel far to look for relief country, as they had to do two years ago.

LAND MEASUREMENTS FOR FARMERS.

Many farmers have a very vague idea of the areas which they place under certain crops. If a question is put to some men as to how many acres they have under maize, potatoes, cotton, or other such crops, they usually estimate it by the quantity of seed sown, not by actual measurement. Especially is this the case with cotton and sisal hemp. A farmer puts in 25 lb. of cotton seed. Having been told that it takes 5 lb. of seed to an acre, he decides that he has got 5 acres under cotton, but this all depends on the manner in which the seed was sown. Only lately we heard of one farmer who stated that cotton would not pay him to grow under 2d. per lb. for the seed cotton. He had obtained and sown seed for 5 acres, and only got about 5 cwt. of seed cotton per acre. When the actual measurement of his cotton field was taken, it was found that he had barely 2½ acres, so that he was obtaining 1,000 lb. of seed cotton instead of half that amount per acre. It is the same with sisal hemp. Six hundred and eighty plants are needed for 1 acre, if planted at distances of 8 feet every way. We have known of 1,000 plants being put in on 1 acre. But the planter, because he had put in 1,000 plants, concluded he had 1½ acres planted. These mistakes lead to the disheartening of intending planters. If they will bear in mind or post up for reference the following simple rules for land measurement, they will always be able to tell exactly how much land is under each crop:—

60 feet	by	726 feet	... ...	1	acre
110 ,,		396 ,,	... ...	1	,,
129 ,,		363 ,,	... ...	1	,,
220 ,,		198 ,,	... ...	1	,,
240 ,,		181½ ,,	... ...	1	,,
440 ,,		99 ,,	... ...	1	,,
5 yards	by	968 yards	... ...	1	,,
20 ,,		242 ,,	... ...	1	,,
40 ,,		121 ,,	... ...	1	,,
70 ,,		69½ ,,	... ...	1	,,
80 ,,		60½ ,,	... ...	1	,,

1 chain = 22 yards.

1 chain	by	10 chains	=	1	acre
2 ,,	×	5 ,,	=	1	,,
2¼ ,,	×	4 ,,	=	1	,,
3⅔ ,,	×	6 ,,	=	1	,,

1 panel of fence equal about 3 yards.

6⅔ panels	by	80⅔ panels	=	1	acre
13⅓ ,,	×	40⅓ ,,	=	1	,,
26⅔ ,,	×	20½ ,,	=	1	,,

Another useful measurement is—

THE QUANTITY OF BARBED WIRE REQUIRED FOR A FENCE.

The estimated number of pounds of barbed wire required to fence the spaces or distances mentioned with one, two, or three lines of wire, based upon each pound of wire measuring one rod ($16\frac{1}{2}$ feet), is as under:—

	1 Line. Lb.	2 Lines. Lb.	3 Lines. Lb.
1 square acre	$50\frac{2}{3}$ ...	$101\frac{1}{3}$ ...	152
1 side of a square acre	$12\frac{2}{3}$ ...	$25\frac{1}{3}$ ...	38
1 square half-acre ...	36 ...	72 ...	108
1 square mile	1,280 ...	2,564 ...	3,840
1 side of a square mile	320 ...	640 ...	960
1 rod in length ...	1 ...	2 ...	3
100 rods in length ...	100 ...	200 ...	300
100 feet in length ...	$6\frac{1}{16}$ ...	$12\frac{1}{8}$ ...	$18\frac{3}{16}$

A British halfpenny measures exactly 1 inch in diameter. Laid on a map drawn to a 1-inch scale, it will just cover 500 acres.

NUMBER OF PLANTS PER ACRE.

Distance in Inches.	Plants.	Feet.	Plants.	Feet.	Plants.
1 by 1	6,272,640	1 by 1	43,560	8 by 8	680
1 ,, 3	2,090,880	1 ,, 2	21,780	8 ,, 9	605
1 ,, 4	1,568,160	1 ,, 3	14,520	8 ,, 10	554
1 ,, 5	1,254,527	1 ,, 4	10,890	8 ,, 11	495
2 ,, 2	1,568,160	1 ,, 5	8,712	8 ,, 12	453
2 ,, 3	1,045,440	2 ,, 2	10,890	9 ,, 9	537
2 ,, 4	784,080	2 ,, 3	7,260	9 ,, 10	484
2 ,, 5	627,264	2 ,, 4	5,445	9 ,, 11	440
3 ,, 3	696,960	2 ,, 5	4,356	9 ,, 12	403
3 ,, 4	522,720	3 ,, 3	4,840	10 ,, 10	435
3 ,, 5	318,175	3 ,, 4	3,630	10 ,, 12	363
4 ,, 4	392,040	3 ,, 5	2,904	10 ,, 15	290
4 ,, 5	313,642	3 ,, 6	2,420	10 ,, 18	242
5 ,, 5	250,905	3 ,, 7	2,074	10 ,, 20	217
6 ,, 6	174,240	4 ,, 4	2,722	12 ,, 12	302
7 ,, 7	128,013	4 ,, 5	2,178	12 ,, 15	242
8 ,, 8	98,010	4 ,, 6	1,816	12 ,, 20	181
9 ,, 9	77,440	4 ,, 7	1,556	15 ,, 15	193
10 ,, 10	62,726	5 ,, 5	1,742	15 ,, 18	161
10 ,, 20	31,362	5 ,, 6	1,452	15 ,, 20	145
10 ,, 24	26,132	5 ,, 7	1,242	18 ,, 18	134
10 ,, 30	20,908	5 ,, 8	1,089	18 ,, 20	121
10 ,, 36	17,424	5 ,, 9	968	18 ,, 24	100
10 ,, 48	13,068	6 ,, 6	1,210	20 ,, 20	90
15 ,, 15	27,878	6 ,, 7	1,037	20 ,, 24	72
15 ,, 30	13,939	6 ,, 8	907	30 ,, 24	60
15 ,, 36	11,616	6 ,, 9	808	30 ,, 30	48
18 ,, 36	9,680	6 ,, 10	726	30 ,, 36	40
18 ,, 48	7,260	7 ,, 7	888		
		7 ,, 8	777		
		7 ,, 9	691		
		7 ,, 10	622		

DESTRUCTION OF NATIVE BIRDS.

Notwithstanding the many insect pests which damage or destroy crops of all descriptions, it seems impossible to impress upon the holiday-maker's mind that, were it not for insectivorous birds, these pests would increase to such an extent as to make the raising of field crops, vegetables, and fruit too expensive a business to be profitable. Even a gun tax, to include the mischievous pea-rifle, would be powerless to protect the birds, in consequence of the practical impossibility of enforcing it in country districts. Whilst the

legitimate sportsman carefully observes the close season for game birds, the boy with the pea-rifle is troubled with no conscientious scruples on that score. He looks upon every member of the feathered tribe which comes within reach of his weapon as the legitimate object of his nefarious sport. If the attention of these shooters were directed only towards the fruit or leaf eating birds, no objection could be raised towards their sacrificing thousands of them. Unfortunately, they cannot discriminate between useful and destructive birds; and who is there to teach them? If every State and private school were supplied with well-executed coloured plates of both classes, the teachers would be able to do a great deal towards minimising the evil. We proposed at one time to issue with every *Journal* one or two such coloured plates, but, unfortunately, these are expensive, and the times have of late been too bad to enable us to carry out the idea. But we shall by no means lose sight of it. Take a few of our insectivorous birds, such as crows, ibis, curlews, owls, night-jars (otherwise morepork), &c. The crow is generally cunning enough to distinguish between a stick and a gun, and less frequently falls a victim to the gunner. Crows, although they are notorious for destroying chickens, young birds, hares, &c., yet render signal service to the farmer by destroying mice, cutworms, wireworms, &c. It has been calculated in Germany by Herr Rörig that "a field mouse and its progeny will destroy 1,000 plants of grain whilst the latter are developing." We know what tremendous losses the plague of mice inflicted on farmers last year. He also stated that "About 3,000 crows, by destroying mice and other vermin, benefit farmers to the amount of £2,500 per annum. In other words, what is commonly but erroneously known as the carrion crow benefits him to the amount of 11d. per bird per annum over and above the loss it causes him by the destruction of chickens, eggs, &c." Anyone who has watched the flocks of ibis on newly-ploughed land, thrusting their long curved bills deep into the soil, and devouring thousands of worms, grubs, beetles, and larvæ, must be impressed with the great value of these birds; yet how often are they shot in mere wantonness and left to rot on the ground? The number of mice consumed by owls is something incredible.

We are indebted to Mr. Hy. Tryon, Government Entomologist and Vegetable Pathologist, for the following information on the food of various birds. Mr. Tryon has been for some time engaged in the work of collecting insectivorous birds, many of which were exhibited last year at Bowen Park. He has also closely studied their habits and examined their stomachs. This scientific phase of the question we do not attempt to deal with; the object of this article is to draw attention to the indiscriminate shooting of birds, destructive or useful, for no other purpose but sport, or "to keep one's hand in," as swallow and marten shooters express it:—

INSECTIVOROUS AND PARTLY INSECTIVOROUS BIRDS.

Ibis.—The food of the birds comprised by this name consists of frogs, especially in the tadpole state, grasshoppers, grass-eating caterpillars, ground-frequenting caterpillars, soil-frequenting "grubs" generally, young fish, &c.

Carrion Crow.—No bird in Australia bears this name that may be erroneously bestowed on the common crow or raven, or on the white-eyed crow, both of which possess feeding habits distinct from those of the European "carrion crow." The food of the bird of coastal Queensland, the former of the two kinds mentioned, includes grasshoppers, locusts, cicadas, moths, grass-eating caterpillars soil-frequenting grubs, and large insects generally. Ticks, rats and mice, eggs of poultry and wild birds, young chickens and ducks (exceptionally); seeds of cereals when broadcasted, plantlets of cereals, maize from the cob (exceptionally), lambs, the eyes of cast ewes and of bogged sheep and cattle; fruit, *e.g.*, pineapples and watermelons; carrion and offal generally.

Pied Crow (*Shrike*).—Insects of various kinds, especially the larger ones, *e.g.*, grasshoppers, locusts, &c.; seeds, berries of wild and cultivated trees, coffee berries, fruit generally—oranges, figs, grapes, strawberries, to most kinds of which it is highly destructive; carrion, including dead birds, &c.

Morepork (Ninix).—The smaller kinds feed on various nocturnal insects, on rodents, on small birds, on young domesticated pigeons. The largest kinds the same, and on birds as large as a laughing jackass—*Dacelo sp.* (Brennan).

Night-jar.—On various nocturnal flying insects, and especially on moths.

Laughing Jackass.—On large insects, grasshoppers, locusts, &c., lizards, iguanas (small), snakes, small rodents (rats and mice), chickens, young birds.

Kingfishers (1. *Halcyon*).—Feed on grasshoppers, mantidæ, noctuid caterpillars, lizards (small), tree frogs, spiders, tipulid flies, beetles, white-ants.

Kingfishers (2. *Alcyone*).—Small fish, aquatic insects, flying insects hovering over water.

Butcher Birds (*Cracticus spp.*)—Feed on large insects (grasshoppers, &c.), small lizards and other reptiles, small snakes, caterpillars, soil-frequenting "grubs," small rodents (mice, &c.), nestling birds, small birds both wild and domesticated, very young chicken, hive bees (exceptionally).

Dollar Birds.—Insects (especially beetles) occurring on the wing and in tree-tops; hive bees (exceptionally).

In all probability there are many persons in this State who are not aware that there is an Act to provide for the protection of native birds. Amongst the provisions of the Act are the following:—

If any person shall wilfully kill or destroy any native bird within the period hereinbefore mentioned, or shall use any instrument whatever, net, or any other means within the period aforesaid for the purpose of killing and destroying any native bird, such person shall upon conviction forfeit and pay a fine of not less than one pound or more than five pounds, and in default of payment undergo imprisonment for any term not exceeding three months.

If any person shall buy, sell, or knowingly have in his possession, house, or control any native bird at any time within the period hereinbefore mentioned, he shall forfeit and pay a penalty not less than one pound or more than five pounds for every bird.

No person shall use a swivel gun, or use a gun otherwise than fired from the shoulder, for the purpose of wounding or killing any native bird, and any person so offending shall upon conviction forfeit and pay any sum not exceeding ten pounds for the first offence, and a sum not exceeding twenty pounds nor less than ten pounds for each subsequent offence.

Nothing in the said Act contained shall apply to any person killing native birds upon his own land for the *boná fide* protection of his own crops, or to any servant killing native birds upon the land of his master by direction of such master for the *boná fide* protection of such master's crops, or to any aboriginal killing native birds for his own food.

Persons offending against the provisions of this Act must give their name and address, and also deliver up any native bird and any instrument, net, or other means used to kill or destroy any such bird, to any person who may demand the same, and any person who shall assault any such person so demanding such bird, net, or instrument, or other means of destruction, shall suffer a penalty not exceeding five pounds, besides any other penalty he may have incurred under this Act, and forfeiture of any instrument, net, or other means used. Half the penalty recovered under the Act will be paid to the person laying the information.

If any person wilfully kills, destroys, or captures any such bird, or uses any instrement, net, or any other means whatever, for the purpose of killing, destroying, or capturing any such bird while such bird is within or flying over a reserve, whether such person is or is not within the boundaries of the reserve, he shall be liable upon conviction to forfeit and pay a fine of not less than one pound or more than five ponds, and in default of payment to imprisonment for any term not exceeding three months.

List of Birds which are Subject to Operation of Acts.

Bitterns
Black Cockatoos
Black Swans
Bower Birds (all species)
Bronzewing and all Pigeons
Brown Hawks
Bustard or Plain Turkeys
Cassowaries
Cranes
Cuckoos
Curlews (Land)
Dollar Birds
Dottrels
Doves
Dragoon Birds (*Pitta*)
Ducks, Wild (of any species)
Emus
Finches
Geese, Wild
Grass Parrots
Great Kingfishers (Laughing Jackasses)
Herons
Honey-eaters
Ibis
Insectivorous Birds (all)
Kestrels (Nankeen)
Kingfishers
Kites
Land Rails (all species)
Larks
Larks, Magpie
Lyre Bird
Magpies (Organ Bird)
Martens
Megapodius (Scrub Turkey)
Minah Birds
Moreporks
Native Companions
Night Jars (Morepork)
Owls
Pheasants
Pigeons, Wild (all species)
Plovers
Plain Turkeys
Quails
Rails, Land and Water
Regent Birds
Rifle Birds
Robins
Satin and all Bower Birds
Spoonbills
Tallegallas (Scrub Turkeys)
Waders (all)
Wagtails
Woodpeckers
Wrens.

List of Native Birds Protected throughout the Whole Year.

Cassowaries
Cockatoos (Black)
Cranes
Cuckoos
Curlews (Land)
Dollar Birds
Doves
Dragoon Birds
Emus
Finches
Herons
Honey-eaters
Ibis
Kestrels (Nankeen)
Kingfishers (including Laughing Jackasses)
Kites
Larks
Magpies
Magpie Larks
Martens
Minah Birds
Moreporks
Night Jars or Owls
Owls
Parrots (Grass)
Pheasants
Robins
Spoonbills
Wagtails (Shepherds' Companions)
Woodpeckers
Wrens.

(Compiled from the Proclamation of 8th February, 1899.)

List of Birds Protected during Close Season.

Bitterns
Bower Birds (all species)
Bustard or Plain Turkeys
Curlews
Dottrells
Ducks (Wild, of any species)
Geese, Wild
Hawks, Brown
Insectivorous Birds (all)
Lyre Birds
Megapodius (Tallygalla or Scrub Turkey)
Native Companions
Pigeons, Wild (all species)
Plovers (all species)
Quails
Rails, Land (all species)
Rails, Water
Regent Birds
Rifle Birds
Satin Birds
Swan, Black
Waders (all)

Certain areas are reserved in most districts throughout the State, within which the destruction of native birds is prohibited during the whole year.

The reserves in the counties of Aubigny and Cavendish are for the protection during the whole year of the following:—Tallegallas, all Pigeons, Emus, Regent Birds, and Quails.

Districts to which the Acts apply.

District.	Close Season.
Burnett, Darling Downs, East Moreton, West Moreton, Wide Bay, Port Curtis	1st September in each year to the 31st March in the following year, inclusive, except as to Quails, for which the close season is from 1st day of November to the 30th day of May of the following year in the Districts of Burnett and East Moreton, and from 1st day of October to 30th day of April of the following year, inclusive, on the Darling Downs and West Moreton.
Petty Sessions District of— Burke, Cairns, Cardwell, Cook, Croydon, Ingham, Mackay, Norman, Palmer, Somset, Townsville	1st November in each year to the 30th April in the following year, inclusive. For Ayr, Bowen, Ingham, and Townsville the close season begins on 1st November and continues to the 31st May of the following year, inclusive. For Burke, Cairns, Cardwell, Cook, Croydon, Mackay, Mourilyan, Norman, Palmer, and Somerset, from 1st October to 30th April, inclusive. In the districts of Ayr, Bowen, Cairns, Townsville, Cardwell, Croydon, Ingham, and Marburg the Acts are in operation all the year round in respect of all waders, all insectivorous birds, including brown hawks and native companions.

For Charters Towers and Cape River the following are the close seasons for various birds:—

From the first day of November in each year to the thirtieth day of April in the following year inclusive.

Bitterns
Black Swans
Bronzewing and all Wild Pigeons
Brown Hawks
Bustards or Plain Turkeys
Curlews
Dottrels
Insectivorous Birds (all)
Land Rails (all species)
Lyre Birds
Native Companions
Plovers (all species)
Quail
Regent Birds
Rifle Birds
Satin Birds and all Bower Birds
Tallegallas or Scrub Turkeys
Waders (all)
Water Rails
Wild Ducks of any species
Wild Geese.

From the first day of January to the thirty-first day of December in each year inclusive.

Black Cockatoos
Cassowaries
Cranes
Cuckoos
Dollar Birds
Doves
Dragoon Birds (*Pitta*)
Emus
Grass Parrots
Great Kingfishers (Laughing Jackasses)
Herons
Honey-eaters
Ibis
Kingfishers
Kites
Larks
Land Curlews
Magpies (Organ Bird)
Magpie Larks
Martens
Minah Birds
Moreporks or Owls
Nankeen Kestrels
Night Jars
Pheasants
Robins
Spoonbills
Wagtails
Woodpeckers
Wrens.

From the first day of September to the thirty-first day of December in each year inclusive.

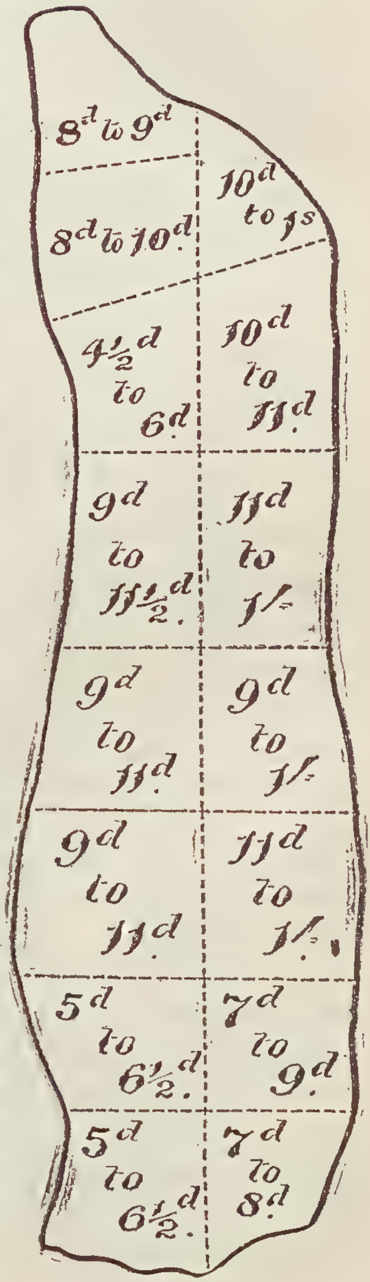
Finches.

Dairying.

THE CANADIAN BACON INDUSTRY.

What Canada is Aiming at.

The Canadians are now devoting a lot of attention to the production of bacon for the London market, where they have already succeeded in getting a solid introductory foothold. The matter is dealt with very exhaustively in a recent bulletin of the Ontario Department of Agriculture.



It is pointed out that, whereas in the United States there is an immense home market for lard and oleomargarine, in Canada there is no trade in oleomargarine and a very much smaller market for lard. The American packer, therefore, can utilise very fat hogs, manufacturing lard and oleomargarine from the fat and placing only the leaner carcasses and the lean part of the fat carcasses upon the market to be consumed as meat, and, as there is a very limited and decreasing demand for fat pork in Canada, the production of a leaner class of hog has become a necessity there.

The United States export enormous quantities of pig products to Great Britain, and, in order to keep out of what is regarded as hopeless competition with the Americans in that market, the Canadians have been forced to cater to an entirely different class of customers. Thus it comes that the lean and carefully-prepared bacon of Canada is taken by the large cities of the United Kingdom, while the American product goes mainly to a less fastidious class of customers at a lower price. Canadian bacon, therefore, does not come into direct competition with the bulk of the American products in Great Britain.

The kind of bacon of which the Canadian packers make a specialty is the "Wiltshire side." To make Wiltshire sides, a hog is required weighing from 160 to 220 lb. live weight. There are no cast-iron limits, though 160 lb. is considered to be rather too light for making the best side. The most suitable weights are given at from 180 to 190 lb. The diagram reproduced shows a retail dealer's method of cutting a Wiltshire side, and the approximate retail values in Great Britain. From this it will be seen that the most valuable meat is found along the upper part of the side as far forward as the shoulder. When the shoulder and neck are reached, there is a very material drop in the value. This teaches that the heavy rough shoulder produces a very undesirable side, because it gives a side which is heavy at the cheap end. It teaches, further, that the hog should have good

length from the back of the shoulder to the ham, because this is the most valuable part of the side of bacon. It will be noticed also that the belly meat is cheaper than the part above it, and this explains why the Canadians require that the bacon hog should have a trim belly and a straight underline.

An experiment was commenced for the purpose of comparing six breeds of swine, both as regards economy of gain and suitability for the export trade. The breeds used were Berkshire, Yorkshire, Tamworth, Chester White, Poland China, and Duroc Jersey. The experiment was repeated in four successive years, making five carefully-conducted tests. In each of the five years six pigs of each breed were used for the test. In five experiments the six breeds were compared as to cost of producing 100 lb. gain, live weight; and in six others the six breeds were compared as to their suitability for export. The tables given bearing on the relation of breed to economy of production revealed the fact that there was little or no constancy in the standing of any one breed, except the Berkshires, which certainly made a remarkably good showing. The conclusion come to, however, was that there was little, if any, relation between breed and power to digest and assimilate food, and that individuality was the all-important factor in this connection.

To determine the relation of breed to the export trade in each experiment, the hogs were shipped to a Toronto exporting firm, where they were slaughtered and the carcasses critically examined by an expert, who was given no information as to the breeds which they represented. Under this test the Yorkshires turned out to distinct advantage, the carcasses being characterised by good length of side, uniformity in thickness of fat along the back, a good general development of flesh (lean), thickly-fleshed loin, thick, fleshy belly, and a fleshy ham, which required little trimming. Their most serious faults ran in the direction of an undue weight of shoulder, coarseness of bone, and thickness of skin, though these defects were noticeable in only a small proportion of the carcasses. The Tamworths generally had a light shoulder and a very uniform layer of fat along the back; but as a rule they did not quite equal the Yorkshires in length of side, thickness of loin and belly, and development of ham. In many of them there was a marked lack of flesh over the loin, accompanied by a thinness of belly and a decided lightness of ham. The strong point of the Berkshire carcasses was their large muscular development, giving a fleshy condition. The ham was well developed; but in many cases it carried too much fat, and required considerable trimming. The main faults were the shortness of side and an undue weight of shoulder, with the fat running very thick over the shoulder top. There was, moreover, a marked lack of uniformity in the Berkshire carcasses, some of them making capital Wiltshire sides, while others were entirely unsuitable. The Yorkshire carcasses, on the other hand, were specially noted for their uniformity. The Chester White, Poland China, and Duroc Jersey carcasses were very similar in character. Occasionally a good Wiltshire side was found among them; but it was a noteworthy exception. Shortness of side, a superabundance of fat, and a lack of flesh were generally characteristic of the group.

The results of the experiments were in direct opposition to the theory that it cost more to produce a pound of gain in a hog of the bacon type than in one of a thick, fat type. It was true that the Berkshire made a better showing in regard to economy of gain than the Yorkshires and Tamworths, which scored highest in the slaughter test; but it was also true that the Berkshires were much superior as bacon hogs to the Duroc Jerseys, Poland Chinas, and Chester Whites, and stood higher in point of economy of gain. The last three breeds were the least suitable for export; and they also stood at the bottom of the list in point of economy of gain. If the experiments proved nothing else, they certainly demonstrated very clearly that a hog of good bacon type could be fed just as cheaply as one of the undesirable type. That also applied to animals of the same breed, but of different types.

Some suggestive hints are also put forward with respect to the selection of bacon boars and sows. The boar, it is recommended, should not only be

pure bred, but well bred—that is to say, he should belong to a family noted for its general excellence in the qualities desired to be reproduced. Showing male character and giving indications of strong constitution, he should have good width between the fore legs, and be thick through the heart or just back of the elbow. He should be deep from the top to bottom back of the shoulder, and the space back of the shoulder should be well filled out, giving a good heart girth. The jowl should be broad and strong, but not fat and flabby; the forehead broad, and the poll broad and full. The neck should be of medium length and strongly muscled, but should show no heavy crown of fat. The shoulders of the boar would be heavier than is desirable in a sow or barrow, and as he grows older "shields" developing on the sides would often give the appearance of roughness. He should be compact on top, however, and blend well with the top line and the rib at this point. The bacon type shoulder is upright, making the animal comparatively short from the back of the shoulder to the head, and long from the back of the shoulder to the ham. This formation gives the largest development where the meat is most valuable. The ribs should arch out boldly from the backbone, then suddenly drop in an almost vertical direction, giving a flat, straight side. This point should receive special attention in making a selection, for it is a sure indication of a strong development of muscle along the back, and muscle is lean meat. The top line should rise slightly above the straight line, giving a very slight arch, the highest point of which is over the loin; the back of medium width, and uniform in width throughout. The loin should be as wide as the rest of the back, and be full, strong, and heavily muscled. The rump should be the same width as the back and loin, slightly rounded from side to side over the top and from the hips to the tail. The ham should taper towards the hock, carrying the flesh well down, especially on the inside of the shank. The underline should be trim and straight, showing no tendency towards a saggy belly; the hind flanks full, giving good thickness through at this point. The legs should be of medium length, and the bone heavy, but clean and presenting a fattish appearance; the pasterns upright, so that the animal walks well on his toes; hair abundant, but not coarse; and carry himself easily without swaying movements. What applies to the boar is held to apply also to the sow, except that in head, neck, shoulder, and bone the latter should be finer. As to what is the best cross has not been determined by systematic Canadian experiment, and it is held that it probably cannot ever be satisfactorily determined, for the reason that so much depends upon the individuality of the animals used.

"Softness" is indicated as one of the greatest defects of quality which Canadian exporters have to contend with. The trade they cater for has not time for soft bacon. Many experiments have been made with the object of finding out what causes contribute to this defect; and among other conclusions arrived at is that, of all the grains in common use, corn has the greatest tendency to produce softness, although its injurious tendency may be modified by mixing with other foods. Other causes indicated are lack of exercise, lack of finish, unthriftiness, and "holding back"—when a hog is "finished" it should be marketed at once, in order to produce firm bacon. If the feed be cut down, so that the hog makes no gain in weight for some time or loses in weight, the flesh from such an animal is considered to almost surely produce soft bacon. Generally it has been found that the best bacon is produced, and produced most economically, on a mixed diet in which skim milk has a place.

Canadian experience in detail has, perhaps, more of a suggestive than a guiding value to pig-raisers in this country, where the conditions are in many important respects radically different; but it is useful to know what class of English trade the Canadians are finding it most profitable to cater for, and the kind of carcass they are seeking to produce for the purpose in view. In this direction at least we may pick up some "pointers."—*Sydney Daily Telegraph.*

ROCKHAMPTON AGRICULTURAL SOCIETY.

Owing to the great demand on our space in the August issue of the *Journal*, occasioned by the publication of the proceedings at the Agricultural Conference at Cairns, we were reluctantly compelled to hold over the following interesting details of the milk and butter tests made at the show of the Rockhampton Agricultural Society in June last. We give the general results below:—

Milk and Butter Competition.

Class 120.—First prize, £5 5s., presented by Messrs. Goldsbrough, Mort, and Co. and Denham Brothers, £2 2s. each, and United Insurance Company, £1 1s.; second prize, £2 2s., presented by Messrs. McIlwraith and Blair; third prize, £1 1s., presented by P. C. Marwedel, Esq. Entrance, 10s.

The prizes will be awarded to cows which reveal the greatest merit in respect of—

(*a*) Quantity of milk.
(*b*) Quantity of butter fat.
(*c*) Ratio of milk to 1 lb. of commercial butter.

The competition is open to cows and heifers of any breed and age.

No cow or heifer will be allowed to compete unless she has calved at least seven days before the opening of the show, and no calf will be allowed in the show.

The points to be awarded in the milking trials comprise—

1 point for every ten days since calving, deducting the first forty days, with a maximum of 14 points.
1 point for every pound of milk, taking the average of two days' yield.
20 points for every pound of marketable butter indicated according to the Babcock test.
Deductions will be made of 10 points each time the fat is below 3 per cent.
In any case of cows obtaining the same number of points, the advantage will be given to that cow which has been longest in milk.
No prize will be given to cows under five years old which fail to obtain 25 points; or to cows five years and over which fail to obtain 30 points.

In arriving at the quantity of butter, the method employed will be that adopted by the Queensland Government.

The milking test will be made on the first day of the show, at the hours of 7 o'clock a.m. and 5 o'clock p.m.

The competing animals must be on the ground not later than 4 p.m. of the day before the show, and they must be milked right out in the presence of a steward at 5 p.m. of that day.

Owners, when entering their cows, are requested to write in their nomination papers the following information as far as it may be known to them, namely—

(*a*) Name of cow.
(*b*) Its age.
(*c*) Its breed.
(*d*) The date of its last calving.
(*e*) The number of days it has been in milk.

Owners are also advised to provide themselves with evidence of the date of calving, to produce in case of protests or disputes.

Rule No. 8 shall not apply.

		Morning.				Evening.			
		lb.	Test.		Butter.	lb.	Test.		Butter.
Class 250.	Daisy	18½	2·2	=	0·455	20	5·0	=	1·12
,, 251.	Blackbird	11⅞	4·6	=	0·611	9½	4·3	=	0·457
,, 252.	Spot	11	3·6	=	0·443	9¾	4·6	=	0·502
,, 253.	Lena	17¼	5·4	=	1·043	12½	6·6	=	0·905
,, 254.	Violet	10⅞	4·0	=	0·487	8¾	4·2	=	0·411

—	Daisy.		Blackbird.		Spot.		Lena.		Violet.	
Morning	18½	0·455	11⅞	0·611	11	0·443	17¼	1·043	10⅞	0·487
Evening	20	1·12	9½	0·457	9¾	0·502	12½	0·905	8¾	0·411
Total	38½	1·575	21⅜	1·068	20¾	0·945	29¾	1·948	19⅝	0·898

Name of Cow.	Points for Time in Milk.	Points for Weight of Milk.	Points for Butter Fat.	Total.	—
Daisy	...	38	31	69	Daisy, deduct 10 points on account percentage butter fat in morning's milk being under 37 per cent.
Blackbird	5	21	21	47	
Spot	2	20	18	40	
Lena	2	29	38	69	
Violet	11	19	17	47	

1st, Lena. 2nd, Daisy. 3rd, Violet. 4th, Blackbird. 5th, Spot.

Dairy Cows.

Class 120a.—Cow, the property of a *bonâ fide* dairyman supplying cream to a dairy factory in the Central District, to have been exhibitor's property at least one month prior to date of entry. Extra prize, £5 5s., presented by Messrs. Conaghan Brothers. Entrance, 10s. Exhibits in this class may, if entered, compete in class 120.

		Morning.	Evening.	Total.
1st.—255.	Blackbird	11⅞	9½	21⅜ lb.
256.	Lena	17¼	12½	29¾ ,,
257.	Spot	11	9¾	20¾ ,,
258.	Violet	10⅞	8¾	19⅝ ,,

Class 121.—Milch cows, to be milked dry by some person appointed by the stewards at 5 p.m. on the day previous to the show, and to be milked in the morning and evening of the show day, in the presence of one or more of the stewards. The greatest weight of milk in two milkings to be the test. Prize will not be awarded if less than 20 lb. First prize, £4 4s., presented by Messrs. Jas. Stewart and Co. and Thos. Kelly and Sons; second prize, £2 2s., presented by Messrs. W. Breckels and Co.; third prize, £1 1s., presented by the Record Printing Company. Entrance, 10s.

		Morning.	Evening.	Total.
1st.—259.	Daisy	18½	20	38½ lb.
2nd.—260.	Lena	17¼	12½	29¾ ,,
3rd.—261.	Violet	10⅞	8¾	19⅝

DAIRY HOUSES.

Messrs. James Campbell and Sons, Creek street, Brisbane, in view of the regulations for the proper construction of dairy buildings formulated by the Department of Agriculture and Stock, are prepared to supply dairy houses, complete in every particular, at very reasonable prices. Following is a description of buildings of various sizes as supplied by the firm:—

The buildings are constructed in three sizes, viz.:—

No. 1, measuring 10 feet by 8 feet
No. 2, ,, 14 feet × 10 feet
No. 3, ,, 20 feet × 12 feet

and are quoted complete, loaded on trucks at Albion, at £22, £31, and £45 respectively. At the front of each building is a loading platform 2 feet 6 inches wide, also a hardwood lattice framework to both sides and back of cream-room, fixed at 3 feet away from the walls to enable a creeper to be grown for shade and cooling purposes. The roof overhangs the walls 18 inches at sides and back and 2 feet over the entrance, and is coated with "Arabic" cooling paint. The rooms are ceiled, and an open space is provided over the ceiling in each gable covered with fine wire netting. Special ventilation is provided by an opening all round in walls immediately under the ceiling, and also above the flooring, filled in with galvanised wire gauze to prevent dust or flies entering. The openings in the gables are protected by boarding part way down at back of barge boards.

The flooring is of 1¼-inch hardwood, tongued and grooved, in full lengths, fixed to fall and drain into a grooved plate at one side, this carrying any liquid from the floor. This arrangement also allows the floor to be washed or hosed at any time. If a cement floor is used, the drain would be in the cement in a similar manner.

The rooms are specially designed to make them as far as possible dust-proof, cool, and perfectly ventilated, and, although costing a little more than the common class of rooms, the advantages to be gained fully justify the extra cost.

COW AND PIG CLUBS.

In some parts of England the mutual insurance of live stock is a form of co-operation which finds much favour amongst small holders and cottagers in agricultural districts where small holdings and allotments are plentiful—where, in fact, as in some parts of Queensland, there is close settlement—the cow and the pig being the two domestic animals principally concerned. A description of the constitution and working of these clubs is given in the May number of the *Board of Trade Journal.* It appears that in South Lincolnshire, for instance, in almost every village and on the outskirts of market towns, such as Borton and Spalding, prosperous pig clubs exist.

A SOUTH AUSTRALIAN COW CLUB.

On somewhat similar lines, a cow club, called the Mylor Cow Club No. 1, was established at Mylor, in the Hills district of South Australia. Through the courtesy of the Secretary for Agriculture of that State, we are enabled to give some particulars concerning the objects and working of the club, which was limited to a membership of thirty farmers, but might be formed as soon as twelve persons agreed to become subscribers. The object was to enable subscribers to obtain good dairy cattle at reasonable rates and practically on deferred payments.

Each subscriber paid into the funds of the club 1s. per week, which amount went into a "cow purchase fund." An entrance fee of 1s. was also paid by each member. When a sufficient amount for the purchase of a cow had been paid into the club, one week's notice was given to each eligible subscriber that a "draw" would be made on a certain date. At that draw every eligible subscriber had the chance of drawing the right to have a cow purchased for his use, and the cow was purchased by the club inspector subject to the successful drawer's approval. The cow was then handed to the latter on his signing a hire purchase agreement. The inspector receives 10s. for each cow purchased for the club. Not more than £6 was paid for any cow, except by special arrangement.

When any subscriber received a cow, the weekly payments were placed at such a rate that the whole of his liability would be met in 130 weeks.

If any subscriber allowed a cow in his possession to stray, provided it was still the property of the club, he was fined 5s. for a first offence, and for the second offence his share in the club and his right to the cow might be absolutely forfeited.

According to a fixed schedule, the first successful drawer paid 1s. per week for fifty-two weeks, the second successful drawer 11d., and so on down to the eleventh drawer, who paid 2d. a week to the end of twelve months or until the expiration of the club. In the case of the Mylor Club, thirty members joined, and twenty cows were allotted, some of the others having drawn their money out, some bought cows on their own account, and others left the district. Everything worked very satisfactorily, and as soon as the club had fulfilled its purpose it was dissolved.

If a cow cost less than £6, the difference was credited to the purchaser; if more than £6, he had to pay the extra amount in cash.

To make them legally responsible, the secretary and treasurer were paid 1s. per annum.

It will thus be seen that a farmer who could not purchase a cow for cash, but could easily pay 1s. per week, could obtain a good cow, and extend the payments over 130 weeks, during which time the animal would more than pay for herself, and the farmer would in addition, in about 2½ years, have become owner of the increase.

It will be observed that in the case of the British cow and pig clubs insurance against loss is the main feature, whilst in the South Australian the acquiring of the animals is the principal object of the club. Cow clubs are not so numerous, dairying having declined of late years owing to the great development of potato-growing in the district.

Cow Clubs.—At Moulton Chapel, however, between Spalding and Wisbech, a flourishing society has been in existence for twenty years. This cow club may be taken as typical of societies of the kind; and as it was established in 1884, and has at the present time a larger membership than ever before, its rules and methods have been fully justified by results. The object of the society is thus set forth:—"This society was formed for the purpose of assisting each other in acts of benevolence when overtaken by misfortune." Curiously enough, no reference is made to the form the "acts of benevolence" should take—viz., the recouping of members for loss sustained by the death of cows.

The society consists of officers and an unlimited number of members, the officers being the president, vice-president, secretary, treasurer, marker, and a valuing committee of three members. The duty of the president is: "To keep order during meeting hours, impose fines, and to see justice done between each member and the society"; the marker brands each cow entered with the letters "M.C." on the horn, or, if the animal be hornless, on the right foot; and the function of the valuing committee is to determine the value in case of illness or death of a cow.

The society does not retain the services of any particular veterinary surgeon, and the members can employ whom they please. If a member's cow fall ill, the owner will report at once to the secretary, who forthwith advises the valuing committee, all of whom—or at least two of the three—go to see the cow as soon as possible. As soon as the committee has appraised the cow and seen its condition, it becomes the property of the society, and the committee can order its slaughter or can otherwise dispose of it. The full value of the cow as a healthy animal is fixed, and of this sum the owner

receives 75 per cent., or 15s. in the £, the cheque on the society's banking account being drawn by the president, secretary, and treasurer.

The total fee payable to the valuing committee is 5s.; and, as in this case the committee comprises property-owners and farmers of a considerable acreage of land, it will be seen that the fee is an extremely modest one, having regard to the fact that cows entered in the society are distributed over parts of no less than eleven parishes within an area of about 12 square miles, Moulton Chapel being the centre.

Any person wishing to become a member of the society must be proposed at a quarterly meeting. The entrance fee is 2s. 6d. for the first cow, and 1s. for each subsequent cow. The subscription is 6s. per annum for each cow, and is payable in four quarterly instalments of 1s. 6d.; the cost of marking is 6d. per cow. Hence, after the first year the cost of insuring three cows would be 18s., while the value of the cows might be any sum between £36 and £65. A member on entering a cow, and describing its age and colour, pays the full annual subscription, and forthwith becomes entitled to the benefits of the club. Promptness in payment of subscriptions is insisted upon under penalty of forfeiting all advantages.

The society above referred to commenced business with thirty-five members and fifty-one cows; there are now 112 members and 225 cows, an average of two cows to each member. The majority of the members have from one to two cows, while some have three and four and even six cows insured.

About 3 per cent. on the average of the insured cows die during the year, milk fever being the principal cause of death. The society sustained a loss of £7 during one year only of the series. There was no epidemic amongst the cows (nor has there been since the formation of the society), but, as it happened, nine cows died during that year, and the disbursements of the society were about £100, requiring a small draft to be made upon the reserve fund.

During the twenty years the funds have accumulated as follows:—

	Funds in Hand. £	s.	d.
At the end of 1884	11	12	2
" 1887	54	2	2
" 1890	119	15	10
" 1893	146	12	3
" 1896	140	12	6
" 1899	179	10	5
" 1902	253	17	11
" 1904	292	3	9

Of the £292 3s. 9d. standing to the credit of the society on 31st December, 1904, £200 is lent on the security of real estate, and the balance is on current account at the society's bankers. The members meet at head-quarters for their annual supper, half the cost of which is discharged out of the club's funds. The secretary, a substantial farmer and dealer, receives an extremely moderate salary for his work.

The society made one mistake, which was soon remedied. Any sort of cow was at first admitted, with the result that the society was imposed upon by a few persons who bought and entered old cows of little value, and claimed average value at death. This practice was effectually stopped by the adoption of a new rule to the effect that no cow would be accepted for insurance which had had more than two calves. Again, if the marker has cause to suspect that any cow required to be marked by him is unsound or diseased, he is not allowed

to mark such cow without the concurrence of the valuing committee; and as the marker is a practical man, and himself a cowkeeper, the society is sufficiently protected. If a member lose a cow or cows from any contagious disease, he is not allowed to enter another until the cowshed and adjoining buildings have been thoroughly disinfected.

The value of the society to small cowkeepers is shown by an examination of the counterfoils of the cheque-book, which indicate that one unlucky occupier of less than 8 acres of land has received payment for four cows; another small farmer, "overtaken by misfortune," for three cows; while a third had on one occasion two cows killed by lightning.

The success of the society is largely due to the fact that the members are thrifty, reliable men, and the responsible officials are substantial farmers, who attend to the business of the society, and whose interest in the club has increased as they witness year by year the advantage which it gives to their neighbours.

Pig Clubs.—The constitution, membership, and working of an average pig club is on similar lines. The management is usually in the hands of cottagers, with the host of the inn as treasurer, the society having a current account at the local bank and a small capital sum invested in the savings bank. Few, if any, of these clubs are registered under the Friendly Societies Acts.

Similar rules are adopted by each society. The entrance fee is usually 1s. for each pig, and 1d. per week subscription for each pig. An extra charge is made for insuring breeding sows, while sucking pigs are not admissible. Some societies limit the number to four pigs for each member, a rule which meets the requirements of nearly all cottagers and allotment-holders.

The pig is marked usually on the right ear, and the marker is paid a fee of 3d. In case of illness the owner promptly reports to the secretary or to a member of the committee, and the valuing committee inspect the pig as many times as is considered necessary, receiving therefor 6d. each. If swine fever is suspected, the matter is reported to the police officer.

The owner has to choose whether he will "surrender" the sick pig to the society or not. If he decide to do so, the committee dispose of the pig as they think fit. The proportion of value allowed to the members varies; in some clubs it is 15s. in the £, in others 17s. 6d., and, occasionally, the full value is allowed.

Pig clubs do not, as a rule, accumulate a large reserve fund. From £20 to £30 is considered a sufficient reserve fund for a club with forty or fifty members, and, occasionally, after this amount is secured, further profits are divided up annually after the manner of dividing clubs. The income of these clubs is frequently augmented by subscriptions from honorary members.

One of the most successful clubs in South Lincolnshire is that of St. Nicholas and Holy Trinity, near Boston. It has been established ten years, has two branches, and a total membership of 135, with 217 pigs insured. Fifteen claims have been paid during the past year, amounting to £39 2s. 1d., against £39 5s. 4d. in 1903. The claims paid since the formation of the club amount to the sum of £207 12s. 4d., and the balance now standing to the club's credit is £55 18s. 5d., an increase for the year of £14 5s. 6d. The sum of £2 is paid to the secretary of each branch as salary, and a contribution from the funds of the club is made towards the annual supper. This contribution amounted in 1904 to £11.

The provision of allotments for cottagers and labourers has caused a rapid increase in the number and membership of pig clubs; and it is now a very unusual sight for a cottager to be seen taking round a "brief," drawn up by the village schoolmaster, asking his neighbours to help him "towards defraying the serious loss sustained through the death of a valuable"—cow or pig.

Poultry.

THE IMMATURE COCKEREL.

Not long ago a suburban poultry-breeder, who raises Plymouth Rocks, decided to kill a long lanky cockerel. A neighbour, however, drew a comparison between the ungainly-looking cockerel and an ungainly-looking colt, the latter after developing into a handsome horse. The cockerel's life was spared. It developed, and when eventually killed it turned the scale at 12 lb. A writer in the *Agricultural Gazette*, London, writes as follows on immature cockerels:—

Half-grown cockerels of the heavy breeds not infrequently present a very lanky and rough appearance, and breeders who have not had much experience with them generally count them the worst of the flock, whereas with a little more time they generally develop into the most typical males in the yard. Young breeders often uselessly sacrifice these birds, preferring their kindred which show a neater and a more set shape. These pretty cockerels, when four or five months old, are very nice to look at, but when they reach eight or nine months old they are rather disappointing; their size has stopped short of standard requirements, and they have taken on the shape and appearance of older birds without their imposing size. When the most typical cockerels of the hatch are being sought for in the case of breeds like Plymouth Rocks, Wyandottes, Orpingtons, Langshans, and Brahmas, the culling process must not take place too quickly, or the object may be defeated. Perceptible defects, such as bad combs, miscoloured legs, feathers on what ought to be clean shanks, knock knees, and such deformities, can receive early treatment; but simple ungainliness in a half or three-quarters grown cockerel should merely be watched for a considerable time, and plenty of bone and muscle-forming food supplied. Birds of lighter breed than those mentioned, such as Minorcas, Leghorns, or Andalusians, seldom appear so raw and unfurnished when about five months old, and selection in their case can be chiefly confined to external points. But even birds of the lighter breeds sometimes bring surprises and disappointments just as they develop into maturity.

CRATE FATTENING THE CHICKENS.

Brief Description of the Simple Apparatus necessary and the Kind of Feed Used.

(Bulletin 91, Minnesota Experiment Station.)

Last week we (*Florida Agriculturist*) gave an article from the Petaluma Poultry Journal on crate fattening cockerels.

The next number of the same paper contained an article on the same subject, which is as follows:—

There are two methods of finishing chickens for market that are practised in both Canada and the United States. One is to place the chicks in crates and let them feed from a trough in front. The other is to remove the chicks from the crate and feed with a cramming machine. Both are very successful in the hands of experts. It seems to be easier to learn crate fattening than it is to

learn the cramming system, although better results are claimed for cramming. We made one test of crate fattening last year. Twenty-four well-bred Plymouth Rocks were selected and placed in two crates. These crates were each 6 feet long, 20 inches high, and 20 inches wide, with doors at the top, and divided into three pens, each containing four cockerels.

The crates are made of 1 × 1 inch strips running lengthwise of the crate and 1½ inches apart, except the front, where the strips are placed perpendicularly and 2 inches apart to enable the chicks to put their heads out between them to eat. They are fed from a shallow trough set 2 inches from the front of the crate. The crates are set on saw-horses 20 inches from the floor, so the droppings can drop through the slatted floor on to sand underneath, where they can easily be removed. The crates were placed in an open front shed, so the chicks had plenty of fresh air without draught. In cold weather, of course, they should be kept in a fairly warm house.

These chicks were about three months old when the test began, and the twenty-four weighed 87·4 lb. At the end of twenty days they weighed 123·6 lb., making practically a gain of 1½ lb. each in twenty days. These chicks were fed ground oats (with the coarser hulls sifted out) mixed quite wet with butter-milk or skim-milk and slightly salted. They were fed three times a day for the first two weeks, and twice a day thereafter. Care was taken not to feed too much at once, and they were never fed quite as much as they would eat. They were fed grit and charcoal occasionally, and watered twice a day from the trough. It required 5⅔ lb. of clear ground oats or 4 lb. of the sifted oats for each lb. of gain. With oats at 30 cents a bushel, the cost of gain would be 5½ cents a lb. With chickens worth from 10 cents to 15 cents a lb., a good profit can be realised. The quality of the meat is improved very much, so an extra price can recommend that farmers try this method of fattening, so they can realise the highest price and be able to market the extra birds in autumn.

CONCRETE FENCE POSTS.

In many districts where timber is scarce, and its cost consequently high, its use for posts, whether for fencing or other purposes, becomes a serious matter; and, under these circumstances, it is natural that some other and cheaper material should be substituted wherever possible. One of these materials is concrete, which when properly used, has been successful in many localities. Both the dry and the wet mixture may be used, but the neatest and best are made with the former, although it is a slower process. The proportion of cheaper material should be substituted wherever possible. One of these materials is concrete, which, when properly used, has been successful in many localities. Both the dry and the west mixture may be used, but the neatest and best are made with the former, although it is a slower process. The proportion of cement to sand may be 1 to 3, or up to 1 to 5; it is easily possible to make the mixture too strong, in cement. Holes should not be put through the posts as a means of fastening the fence to them. Hooks and staples and eyes made of wire embedded in the posts have been tried, but the best form is one that is said to fix the fence and posts rigidly together. There are various ways of doing this, depending on circumstances. For constructing the posts, wooden moulds, being cheap, light, and easily constructed, are the best. They should be collapsible, so that the post can be removed from them in from twenty-four to forty-eight hours after making. Two men can make from 175 to 200 a day. They will stand freezing without harm, and the hot weather has no injurious effect on them. By tapering the posts it is possible to effect a very considerable saving in the quantity of cement used.—Mr. J. A. Mitchell, before the Association of Cement Users, Indianopolis, U.S.A.

The Orchard.

PREPARATION OF FRUIT PULP.

Pulping is a useful method of dealing with fruit in wet seasons, when it would otherwise quickly spoil; or in periods of glut and low prices, when it is desired to keep the fruit in a form in which it can be sold for manufacture into jams or preserves at favourable opportunities. In ordinary seasons it would more often pay the grower better to sell his fruit raw than to pulp it; but there is always a certain quantity of damaged soft fruit which, while not fit for sale raw for table use, is suitable for conversion into pulp.

The varieties of fruit pulps for which there is the greatest demand are—raspberry, apricot, currant, plum, greengage, and gooseberry. There is also a market for apple pulp in seasons when other fruit is scarce.

The plant necessary for pulping on a moderate scale for the wholesale trade does not involve a very large outlay of capital. A large shed divided into two rooms will usually afford ample accommodation for the fittings and utensils required. In one room the fruit is boiled in small copper vats, of a capacity of 30 gallons each, which are arranged against the wall, the remaining space being occupied by the casks and other receptacles into which the boiled pulp is poured and allowed to cool. The second room contains the boiler which generates the steam for heating the copper vats, and in this room the casks, jars, tins, &c., containing the pulp are finally closed and made ready for market.

Any type of boiler is suitable so long as it will produce steam readily at a small expenditure of coal.

The vats consist of copper pans with outer jackets or pans of iron, upon the rims of which the inside copper pans are suspended. Between each inner and outer pan there is a space of half an inch in which the hot steam circulates. The vats are supported on uprights fitted with brackets which allow them to be turned for emptying or filling, as the case may be. Sometimes the pans are heated by hot water instead of by steam, but this system is not considered so satisfactory.

The method of dealing with various kinds of fruit may now be described. It should be noted that the better the quality of the fruit the better will be the pulp.

In the case of hard fruits, such as apples and pears, the fruit is first cut up into small pieces without being peeled, and without removing the cores or seeds. For the finer kinds of jellies it is, however, better to grind or crush the fruit in a pulping machine. The pieces of fruit are afterwards put into cold water to prevent them turning brown, and, if they show a tendency to discolour quickly, salt is added to the water at the rate of rather over 1½ oz. to the gallon. The next step is to deposit the cut fruit in the vats, in which it is boiled with a little added water until it becomes quite soft. This operation is assisted by the use of a wooden stirrer. When the fruit has been boiled to a pulp it is strained through cowhair sieves, which remove all the coarse parts, cores, and seeds. The strained pulp is then again boiled and continually stirred until it is of such a consistency that it will hang without dropping from a silver spoon dipped into the mass.

Apples or pears will usually yield a fifth of their weight in pulp. If very hard or unripe fruit is used, sugar should be added at the rate of ½ to 1½ lb. per 10 lb. of fruit as required.

For plums and soft fruits the process is almost identical with that described above. Ripe plums, the fruit of which separates easily from the stones, make the best pulp. The plums are put into the copper vats described above, and sufficient water is added to cover the top layer of fruit. The process of boiling is then proceeded with, the contents of the vats being constantly stirred until the whole becomes a pulpy mass. This is then poured through a cowhair sieve to remove the skins, stones, and coarse particles, and the strained pulp is again boiled; but at this stage sugar is usually added at the rate of 4½ lb. to each cwt. of fruit converted into pulp. The boiling and stirring are continued until the pulp is thickened sufficiently to hang from a spoon without dropping.

For raspberries and strawberries the boiling must not be prolonged, and the pulp need not be strained through so fine a sieve as in the case of plums.

The scum must in all cases be skimmed from the pulp at the first boiling, and this operation should never be neglected in the pulping of stone fruits.

Fruit pulp can be prepared without the addition of sugar, though sometimes a small quantity is added in the proportions described above. The usual practice, however, is to pour a solution of sugar (in the proportion of 1¾ lb. of cane sugar to ½-gallon of hot water) over the pulp after the latter has been placed in the jars or other receptacles and immediately before these are closed.

When no sugar is added to the pulp, the latter is well shaken down in the jars or tins, which are then placed for a short time in a warm oven until a hard layer has formed on the top of the pulp.

The jars, tins, or bottles intended to hold the pulp must be thoroughly cleaned before being used. They should be first well washed out with hot water, then rinsed with tepid water containing a little salicylic acid, and afterwards dried. It is a good practice to limewash the walls of the shed in which these receptacles are cleaned. Small casks used for pulp are sometimes treated for four or five minutes with a solution of 1 oz. of bisulphite of lime dissolved in a quart of water.

Tins are the most suitable receptacles for the storage of pulp. After being filled, they are soldered down and boiled in water, which makes it possible to detect any tins that are not airtight. Tins take up very little room, and preserve the pulp for a considerable period.

Glass bottles are sometimes used—the best are those which are closed with glass stoppers or flat glass plates, and afterwards tied down with parchment paper; and there is an improved form of bottle which can be hermetically sealed. The bottles must be boiled after the pulp has been put into them.

Casks are occasionally used for pulp which is to be stored for some time, but they are chiefly employed for the cheaper kinds, such as apples and plums.

Large stoneware jars are commonly used for the storage of soft fruit pulps. It is usual to place a piece of parchment paper saturated with spirit on the top of the pulp, and to cover the corks in the jars with parchment paper.

A cool dark shed with a tiled roof is the best storage place for pulp, and the jars or other receptacles should be placed on open shelves round the walls, so that the air may have free access to them.

The principal points to which care should be devoted are the processes of boiling the fruit. The first boiling should be continued only so long as the consistency of the mass is such as will enable the pulp to pass through the sieve for straining, and at the second boiling the pulp must not be allowed to get too thick, otherwise it will acquire a bitter flavour.—*Journal of the Board of Agriculture.*

Apiculture.

BEES AS AIDS TO AGRICULTURE.

For hard work, energy, and thrift the example of the bee has been held up as an object-lesson to indolent boys from time immemorial. Many look upon the bee only as a collector of the delicious honey which gives so much pleasure in the nursery and finds its way into a variety of soothing concoctions for infantile ailments, or, cunningly mixed with good old rum and hot water, proves a capital remedy for a father's cold. It is not, however, as a honey merchant that the bee appeals to the agriculturist and fruit-grower, but as a fertiliser of fruit and farm crops generally. Comparatively few farmers give the bee more than a passing thought, and rarely consider in what way or to what extent the little creatures benefit them or their crops, and fail to appreciate the important part the bee plays in Nature's economy.

The life of the individual bee is a comparatively short one, and has long passed before the full result of her work is apparent; indeed, in this respect she is like some of our clever men, whose labours are only appreciated when the author has passed to the "great beyond." To those who have not considered the good done by the bee, or the manner in which it is performed, it may briefly be pointed out that the blossoms of most fruits and plants carry within themselves the wherewithal for fertilisation. In the centre of the flower will be found the pistil, at the base of which is the ovary or seed case. This is the female portion. The male section is represented by a number of stamens which cluster round the pistil, each crowned with a tiny wad of pollen. To perfect fecundation the pollen must in some way be conveyed to the pistil, and this is usually done by insect agency, in which the bee plays such a prominent part. In her search for pollen and nectar wherewith to make bee-bread, &c., for her brood, she forces her way into the blossom, when the pollen clings to her body (for all working bees are females), and in passing from flower to flower she carries the pollen from the stamens to the pistil, down the inside of which it is conveyed to the ovary or seed case, and so by bee agency fertilisation takes place. In some plants the blossoms are male and female, while in others the male blossoms are on one plant and the females on another, and here insect agency is most important. When the blossom is fertilised it soon fades and loses its beauty, having no longer any need of gay colour and fragrant breath to attract the bee.

Some years ago, at a place in Mass., U.S.A., the fruit-growers got a notion that bees were detrimental to their crops, and this was followed by the removal of bees from the place. A couple of seasons was sufficient to show that, although the trees were covered with blossoms, the fruit yield was very indifferent. The bees were, therefore, again introduced, with the most satisfactory results. Although a certain amount of fertilisation is caused by the wind, it must not be forgotten that this element has a knack of blowing "where it listeth," or for that matter of not blowing at all when wanted, and is, in fact, beyond the beck and call of the husbandman. Bees, however, are subject to control, and much good may be done by encouraging bee-keeping by cottagers and others employed on the holding, also by keeping a few stocks on the farm itself.

In impressing upon farmers and fruit-growers the great value of bees as fertilising agents, the fact must not be overlooked that the honey supply will amply and abundantly repay for the small amount of labour bestowed upon the bees.—*Agricultural Gazette*, London.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order DILLENIACEÆ.

HIBBERTIA, Andr.

Sect. Pleurandra.

H. concinna, *Bail. sp. nov.* (So named from the neat appearance of plant.) A small shrub clothed more or less with weak spreading hairs, somewhat dense on the branchlets and back of sepals, more distant on the leaves. Leaves crowded, linear, about 5 lines long, the closely revolute margins disclosing little more than the midrib underneath, sessile and obtuse. Flowers sessile and solitary at the ends of the branchlets. Sepals 5 lines long, the outer ones lanceolate, the inner ones rather broader than the outer and almost obtuse. Petals broadly-cuneate, emarginate, about 4 lines long, and quite as broad at the top. Stamens 15, filaments scarcely half as long as the anthers and irregularly united at the base; anthers linear, about 1¼ lines long; no staminodia. Carpels 2, densely silky. Styles spreading purple. Ripe carpels not seen, and only one specimen received; thus we may suppose the plant scarce.

Hab.: Herberton, *R. C. Ringrose.*

Order RUTACEÆ.

ASTEROLASIA, F. v. M.

A. woombye, *Bail.*; Ql. Fl. 195, Pl. VIII.; **var. intermedia.** Differing from the normal form only in the size of leaf, which seldom exceeds 10 lines in length, and its oblong form.

Hab: Mount Coolam, *W. Fawcett-Story.*

Var. parvifolia. Leaves oblong, seldom exceeding the length of 6 lines.

Hab.: Mount Coolam, *W. Fawcett-Story.*

[I may take this opportunity to correct a mistake occurring on Plate VIII. of the Queensland Flora, where the ovary of the separate flower figured is wanting in the lines to show the cocci mentioned in the diagnosis. No fruit available for examination; thus, when better known, these plants may have to be placed in the genus *Phebalium.*]

Order LEGUMINOSÆ.

MIRBELIA, Sm.

M. Ringrosei, *Bail. sp. nov.* (After R. C. Ringrose.) Shrub about 2 ft. high; branches and leaves when young clothed with silky-white hairs, angular from the raised lines from the bases of the leaves. Leaves narrow-linear, ½ in. long, scattered or almost verticillate in threes, margins closely revolute, silky-

ERRATUM.

Vol. XV., Part 8, p. 899. Contributions to the Flora of Queensland. Order, Coniferæ.—In note on Podocarpus, for "gums" read "genus."

hairy on the back with a minute blunt recurved point; petioles minute. Flowers blue and white, clustered at the ends of the branchlets. Pedicels 1 line long, rather stout, silky-hairy mixed with dark short glandular bristles. Bracts and bracteoles similar to the leaves, only much smaller. Calyx silky-hairy outside, purple inside; tube about $1\frac{1}{3}$ lines long, lobes about the same length; 2 upper ones broader and united to near the top. Standard 4 lines broad, blue, the centre and claw yellowish-white; wings blue with yellowish-white claws, nearly as long as the standard; keel petals scarcely more than half the length of the wings; yellowish-white and almost membranous on linear claws. Ovary nearly or quite glabrous, stipitate. Pod about 6 lines long and 3 lines broad, prominently reticulate, bursting at the apex, and resembling a 4-valved capsule. Seeds 2 or 3 in each cell.

Hab.: On the ranges between Irvinebank and Watsonville, *R. C. Ringrose.*

Order LABIATÆ.

PROSTANTHERA, R. Br.

P. atroviolacea, *Bail.* (From the dark violet-coloured calyx.) A shrub of about 4 ft. in height, the branches clothed with strigose or appressed hairs. transparent on the young parts, giving a silvery appearance to the shoots, Leaves opposite, not exceeding 1 in. long and 2 lines broad, linear, obtuse, tapering to a very short petiole, incurved, almost conduplicate. Flowers axillary near the ends of the branchlets. Pedicels short, slender, scarcely exceeding 1 line, clothed with similar transparent hairs to the rest of the plant, bearing at the summit a pair of narrow-linear, hairy, purplish bracteoles about $2\frac{1}{2}$ lines long. Calyx silky-hairy, the upper lip 5 lines long and nearly as broad as the base, obtusely 3-lobed, deep-violet outside, the inside beautifully reticulate, the lower lip much smaller than the upper and nearly orbicular. Corolla 7 lines long, pale-violet, hairy, tube enlarging upwards; upper lip 2-lobed, lower one longer with fringed margins and 3-lobed. The nearest ally of this plant seems to be *P. lithospermoides*, F. v. M.

Hab.: Herberton, *R. C. Ringrose.*

Order APOCYNACEÆ.

LYONSIA, R. Br.

L. largiflorens, *F. v. M.*; Benth. in Fl. Austr. IV., 322. Fruit hard, about $3\frac{1}{2}$ in. long, 5 lines broad, shortly tapering at both ends, tardily separating into 2 folicles, deeply striate, and clothed with short light-brown hairs. Seeds 5 lines long, angular, nearly glabrous and glossy, light-coloured; coma brownish, the hairs of unequal length, 4 to 9 lines long. The fruit of this species does not seem to have been previously described.

Hab.: Coen, *R. W. Garraway.*

Order NEPENTHACEÆ.

NEPENTHES, Linn.

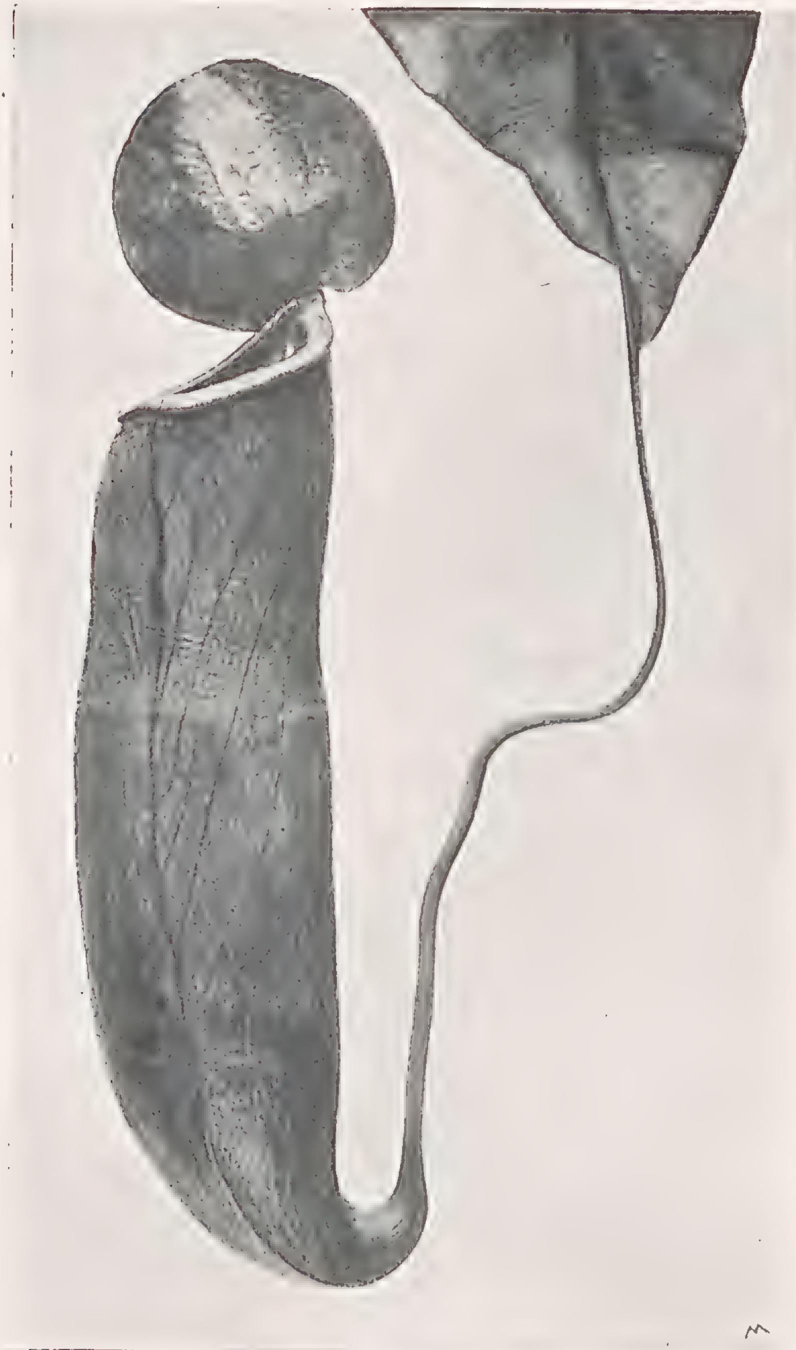
N. pascoensis, *Bail.* Plate No. II. A dwarf plant, more or less stellate, tomentose in all parts. Leaves of a somewhat thin texture, lamina oblong-lanceolate, 6 in. long, 2 in. broad, decurrent upon a petiole about 2 in. long, longitudinal nerves prominent, about 5 on each side of the midrib, transverse veins not so prominent, the naked portion of the midrib between lamina and pitcher slender, 3 to 4 in. long with a single or double curl in the centre. Pitcher about 3 in. long, slightly inflated at the middle; anterior ribs cord-like but not winged or crested; orifice wide; peristome very narrow, smooth, and glossy,

Plate II.

Male. Female.

Nepenthes pascoensis, *Bail.*

Plate III.



Nepenthes Armbrustæ, Bail.

Plate IV.

NEPENTHES GARRAWAYÆ, *Bail.*

the oblique-longitudinal nerves numerous but not prominent, the transverse veins rather faint. Posterior spur rather long, curved, and somewhat emarginate at the end. Operculum sub-orbicular, about 1 in. diameter. Glands inside minute, covering the surface three-parts up the pitcher. Inflorescence (male) arising from the end of stems with a few abortive leaves at the base. Peduncles about 3 in. long, racemes about 2 in. long, pedicels about 4 lines long; perianth-segments ovate, purple, 2 lines long; staminal column 3 lines long; head of anthers small. Female inflorescence like the male but smaller, the ovary densely pubescent. In the pubescence and the curl of the pitcher stalk the present species closely resembles *N. Kennedyana*, but its dwarf non-climbing habit is sufficient, in my opinion, to keep them distinct.

Hab.: Head of Pascoe River, *R. W. Garraway*, who describes the plants as small shrubs.

N. Armbrustæ, *Bail.* (After Miss F. Armbrust). Plate No. III. Leaves nearly glabrous, of thin texture; the expanded portion or lamina 6 in. long and 2 in. broad, tapering at the base to a flattened slightly winged petiole about $1\frac{1}{2}$ in. long; midrib very prominent, longitudinal nerves 5 on each side of midrib, transverse reticulations prominent, naked portion of midrib between lamina and pitcher 4 in. long, without a curl. Pitchers about 4 in. long, at the expansion $2\frac{3}{4}$ in. wide, shortly narrowed at the base and sharply recurved; anterior ribs neither prominent nor winged, longitudinal nerves often branched, reticulate veins rather close. Peristome narrow; posterior spur rather slender, Operculum orbicular, about $1\frac{1}{4}$ in. diameter, glands on under surface numerous. Glands inside of pitcher covering the surface for two-thirds the way up, the upper portion variegated with the brownish-purple upon a pale-yellow ground so common in the Australian species. A portion of the male inflorescence sent with the specimen was clothed by a rusty pubescence; pedicels 2 to 4 lines long, perianth-segments ovate, deep-purple, somewhat rugulose and about half as long as the pedicels, and $1\frac{1}{2}$ lines broad. The staminal column with globose-head of anthers about 2 lines long.

Hab.: Coen, *Miss F. Armbrust.*

N. Garrawayæ, *Bail.* (After Mrs. R. W. Garraway.) Plate No. IV. A dwarf plant, not of climbing habit. Leaves, the broad lamina portion about 9 in. long, $2\frac{1}{2}$ in. broad in the centre, texture rather thin, tapering to a winged petiole, and slightly, as in other species, stem-clasping at the base; the naked portion of midrib between lamina and pitcher about $5\frac{1}{2}$ in. long, slender, without curl or loop. Pitchers, lower half green, upper deeply stained a brownish-red, more or less inflated about the centre, narrowed at the top but not forming a prominent neck, length about 4 to 6 in. Orifice oval, $1\frac{3}{4}$ in. long. Anterior ribs forming reddish-brown prominently-veined wings 3 lines broad, with rather distant conspicuous cilia. The peristome 3 lines broad, posterior spur rather long, recurved, and stout; longitudinal nerves and transverse veins prominent. There are also below the spur a few bristles. Operculum orbicular-ovate, about 2 in. diameter, deep reddish-brown, glands on under surface rather small. The glandular portion inside pitcher extending half-way up. The present species approaches *N. Bernaysii* in its ciliate pitcher wings, and *N. Rowanæ* in its broadish peristome.

Hab.: Between York Downs and Weipa, *R. W. Garraway.* (Plate represents pitcher of medium size only.)

Order LEMNACEÆ.

WOLFFIA, Horkel.

Fronds minute, emitting no fibres. Flowers bursting from a cavity on the upper surface of the frond, without any spatha or bract. Anther 1, globular, nearly sessile, opening in two valves. Ovary globular, with a single erect ovule; style short, with a broad stigma.—Benth. in Fl. Austr. VII., 162.

W. arrhiza, *Wimm., Benth. l.c.* Fronds almost oval, scarcely ½ line long, thick all over.—*Lemna arrhiza*, Linn.

Hab.: In waterholes, Chelmer, *G. E. Primrose.* Among plants of *Eichhornia speciosa, Hydrocharis morsus-ranæ*, and *Lemna oligorrhiza.* The genus has not previously been met with in Queensland; and the only other Australian State in which it is represented is Victoria, where the late Baron Mueller records having received specimens from the swamps about Mount Emu.—Ex. Fragm. Phyt. Aust. VIII., 188.

Order GRAMINEÆ.

ISCHÆMUM, Linn.

I. ciliare, var. ? podostachyum, *Benth.*, Fl. Austr. VII., 520. Stems erect from a shortly decumbent or creeping base. Leaves short, glabrous, the ligula prominent, nodes bearded. Spikes scarcely 1 in. long, 2 at the end of the peduncle, but one of them shorter and attached lower down, giving the other a pedunculate appearance. Pedicels ciliate. Sessile spikelet 3 lines long, the outer glume lanceolate, acutely acuminate, the nerves more conspicuous and not so smooth as in the typical *I. ciliare;* 2nd glume as long but thinner, narrow, and keeled; 3rd, nearly as long, very acute, with a male flower; 4th or terminal glume, hyaline, deeply 2-lobed with a slender awn not twice as long, enclosing the hermaphrodite flower. Pedicellate spikelet nearly similar, but containing only a male flower and no awn.

Hab.: Mount Abundance, *R. E. Soutter*, May, 1905. These specimens show a taller habit and longer, more numerous spikes than the type.

Order FUNGI.

POLYSTICTUS, Fries.

P. sideroides, *Lév.;* Sacc. Syll. Fung. VI., 223. Pileus sometimes 2 to 3 in. across, corky, somewhat funnel-shaped, zonate, and stipitate; stipes excentric, short and thick, velvety-ferruginous; pores minute, somewhat long, angular, dusky, ferruginous inside, dissepiment thin and acute.

Hab.: Atherton, on trunks of trees, *Miss V. Moffat.* Also met with in Sumatra and Java.

GLŒOPORUS, Mont.

(Pores gelatinous.)

Fungus heterogenous. Hymenophorum coriaceous, contex, floccose-cellulous. Hymenium tremellose-gelatinose, very white, contiguous with the hymenophore, dots impressed, contracted when dry, but not visible to the naked eye, moist gelatinous, porous. Pores rotund, superficial, obtuse.—From Sacc. Syll. Fung. VI., 403.

G. leptopilus, *Lév.;* Sacc. Syll. Fung. VI., 403. Pileus 2 or more inches across and about ½ line thick, membranous-coriaceous, semi-orbicular, tomentose, zonate, whitish-yellow; margins lobed, undulate, acute, sterile. Pores angular, shortened, unequal, brownish at first, gelatinous.—Sacc. l.c.

Hab.: Atherton, on the trunks of trees, *Miss V. Moffat.* Also met with in Surinam.

CORYNE, Tul.

(Club-shaped.)

Fungi gelatinous, sessile, or shortly stipitate, globose or top-shaped; disc usually plane or convex; sporidia elongated, hyaline, septate or pseudo-septate—Cooke's Handb. of Austr. Fungi, 271.

C. Moffatæ (after Miss Violet Moffat), *Mass. sp. nov.*

Hab.: Atherton, *Miss V. Moffat.* Mr. G. Masser's description not in hand.

XYLARIA, Hill.

X. escharoidea, *Berk.;* Sacc. Syll. Fung. I., 316. Clubs corky, simple cylindric, apiculate, scabrous by the rather prominent osteoles, pale; stems elongate cylindric.

Hab.: Atherton, on logs, *Miss V. Moffat.* Also in Ceylon.

SPHÆRELLA, De Not.

S. Banksiæ, *Cke. and Mass.;* Grev. XVI., 114; Cooke's Austr. Fung. On the upper surface of leaves. Spots none, perithecia gregarious, rather innate, black, pierced with a pore. Asci clavate; sporidia elliptic, uniseptate, hyaline, 12 x 5 μ.

Hab.: Peel Island, Moreton Bay, *W. Soutter.* On the leaves of *Banksia integrifolia, var. paludosa;* also in Victoria on Banksia leaves.

UREDO, Pers.

U. crepidis-japonicæ, *Lindroth;* Acta Soc. Fauna et Flora Finníca, XXII., p. 11 (1902). Sori amphigenous but often hypophyllous, cinnamon brown, round, minute, at first surrounded by the ruptured epidermis. Uredo spores sub-globose or broadly ellipsoid, yellowish, finely-echinulate, with 3 scattered germ-pores and epispore 1 μ thick, 14-18 μ diameter.

Hab.: Queensland, on leaves of *Crepis japonica.* The above has been kindly sent me by Mr. D. McAlpine, Government Vegetable Pathologist of Victoria. The locality where the *Crepis* was infested with the blight and the name of person who sent the specimens to Europe are unknown both to Mr. McAlpine and myself. The host-plant is one of very wide range.

SEPTORIA, Fries.

S. Rosæ, *Desm.*; Sacc. Syll. Fung. III., 485. Spots dark, girt by a purplish or reddish-yellow zone. Perithecia upon the leaves minute, somewhat depressed, numerous, brownish. Sporules acicular-clavate, 70 to 90 by 3, 5 to 4 μ, subhyaline.

Hab.: Brisbane Gardens. The rose bushes have during the past year suffered more than usual from this pest. It attacks also the rose foliage in Europe.

ERADICATION OF WATTLE-TREES.

The spontaneous growth of young wattle-trees on enclosed land is a source of much trouble in this State, and nothing short of grubbing them out will get rid of them. The *Natal Agricultural Journal* states that by sowing *Paspalum dilatatum*, the wattle will be completely eradicated. That journal, under the heading of "The Vigour of Paspalum," says:—"About the vigour of *Paspalum dilatatum* we have often written, on some occasions pointing out the undesirability of establishing this grass near ground under cultivation. Recently we were informed by a Mooi River resident that in ground which had been a wattle plantation, and over which paspalum seed had been drifted by the wind, that out of the contest the grass proved victorious. To eradicate wattle has always been regarded as a big business, and by many as one practically impossible of accomplishment. We were informed that for a considerable time the grass plants and the wattle plants appeared to be running so evenly that the chances for supremacy seemed equal, but eventually the grass emerged from the struggle triumphant."

Tropical Industries.

SANSIVIERIA, OR BOWSTRING HEMP.

There are three species of *Sansivieria*, to which the name bowstring hemp is given, though there are a dozen species in the genus. The three species are—*S. guineensis*, *S. zeylanica*, and *S. latifolia*, the first named being known as African bowstring hemp; *S. zeylanica* is the best known, however, and is common on the Ceylon coast, from which it takes its name. The leaves are stated by most authorities to be from 3 to 4 feet in length, although, according to the report of the United States special agent, Mr. C. R. Dodge, in charge of fibre investigation, from which this article is taken, he has cleaned leaves for their fibre in Florida that measured nearer 7 feet, and 100 lb. of selected leaves in one lot cleaned averaged 6 feet. In the Kew Bulletin for April, 1887, it is stated that plants of this genus require a rich, moist soil and a comparatively humid climate, and that, being essentially tropical plants, they do not thrive in a temperature less than 60 degrees Fahr. Under such conditions, they grow rapidly, and establish themselves permanently by means of their large spreading rhizomes or underground stems. It is true they will grow in comparatively dry districts, and even in soils strongly impregnated with salt. The strength of the fibre, as tested by the Agri-Horticultural Society of India, was found sufficient for hawsers and cables, whilst their fineness and tenacity are attested by their being used by jewellers for thread upon which to string pearls. It is, however, too fine and too valuable a fibre for cordage, in view of the fact that manila, sisal, and common hemp are to be obtained abundantly and are sufficiently strong for this purpose.

The native method of preparing this fibre is to place the leaves upon a smooth board, then press one end of the leaf down with one of the great toes, and with a thin bit of hard stick they scrape the leaf from them, and very quickly remove every particle of pulp. This is also accomplished by steeping the leaves in water until the pulpy portion decays, when the fibre is washed and cleaned, though, in some cases, steeping injures the fibre. It is estimated that 40 lb. of fresh leaves, 3½ feet or 4 feet in length, will yield 1 lb. of clean fibre or over 1,600 lb. per acre at a gathering, and, with a favourable gathering, two such gatherings may be assumed annually.*

The United States Department of Agriculture in 1892 received 1 ton of *Sansivieria* leaves, which were cleaned at the experimental fibre factory on Biscayne Bay, and a quantity of superb fibre was obtained. The leaves varied in length from 2½ feet to 7 feet, and it was possible to select over 100 lb. of leaves that averaged 6½ feet, and which gave fibre averaging 6 feet in length. Careful experiments, based on the quantity of *Sansivieria* fibre produced in our experiments, would fix the yield at about 40 lb. of fibre to the ton of leaves. The machine used made too large a percentage of waste. The waste was not weighed, but it is very safe to state that, with only reasonable wastage (cut fibre and fibre drawn out with the pulp), the yield of fibre per ton would come nearer to 50 lb. Even if this is considerably lower than the yield of sisal hemp, the quick growth of the plant, the ease with which it can be harvested and handled, and the higher price of the fibre will probably more than make up for the difference in yield of clean fibre.

The material is too good for cordage in the usual acceptance of the term. It is so much better and finer than the cordage fibres, so-called, that it would doubtless find a use in the manufacture of fine twines, and I think, with proper preparation, could be made into a fair spinning fibre, and possibly be employed

* From 80 lb. of *Sansivieria* eaves received from the Brisbane Botanic Gardens, I obtained 2 lb. of beautiful fibre, 4 feet in length, the waste from cleaning not being included in the weight. This is equal to 1 lb. from 40 lb. of leaves.—Ed. *Q.A.J.*

Plate V.

Sansivieria, or Bowstring Hemp (Murva).

in some new form of manufacture. The fibre is fine, white, and lustrous, the leaves yielding readily to treatment in the machine in the fresh state.

Propagation and Cultivation.

For convenience, the leaves are cut into sections about 4 inches long, and inserted into boxes of earth to the depth of about 2 inches; the soil must be moderately dry, as too much moisture will cause the leaves to rot. The boxes must be placed in a moderately shady place, and in a few weeks' time the cuttings will put out numerous fibrous roots, which will soon be followed by suckers. The plant can also readily be propagated by its rhizomes or roots, which grow without any difficulty.

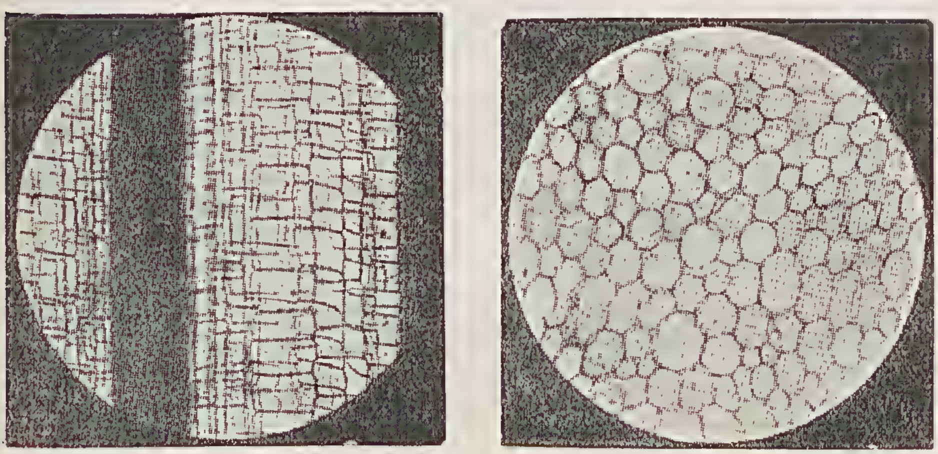
Sansivieria requires good rich soil to succeed well, and will, under favourable circumstances, acquire its full growth in about twelve months' time; ordinarily, however, it will not acquire its full growth until some time in the second year.

When once the land is stocked with its growth it will always, when cut, get a full growth from the roots inside of twelve months, so that it is perfectly safe, after the second year, to count on a full crop every year, the growth each year becoming denser, and in a few years becoming so thick that it would appear impossible to cultivate it, which, however, appears to be needless, as, when once fully established, it takes entire possession of the soil, entirely eradicating everything else also. It does not appear materially to exhaust the soil, as it will grow for a number of years in the same place, and continue to make a vigorous growth. *Sansivieria* is essentially a tropical plant, but will stand a slight frost. It will, after reaching maturity, if not cut, stand without injury for a number of years, the plant at the end of that time affording just as good fibre as in the first or second year of its growth. I am satisfied that a plantation would last over ten years without any necessity for renewing it or for interfering with it in any manner. *Sansivieria* will, after it is well established, afford a crop of 5 tons of cleaned fibre per acre, worth, upon estimate, about 100 dollars (£20) per ton.

I selected a few square feet where the growth was thickest, as an experiment, to show how much a crop was capable of producing. I cut and cleaned the leaves, and found they gave at the rate of 13½ tons of clean fibre per acre. I do not believe, however, that the average crop will go over 5 tons per acre, which I consider a fair estimate.

MEGASS AS AN ABSORBENT.

With a view to demonstrate the reason for the remarkable absorbing power of the cells of the sugar-cane, the photo-micrographs illustrating these

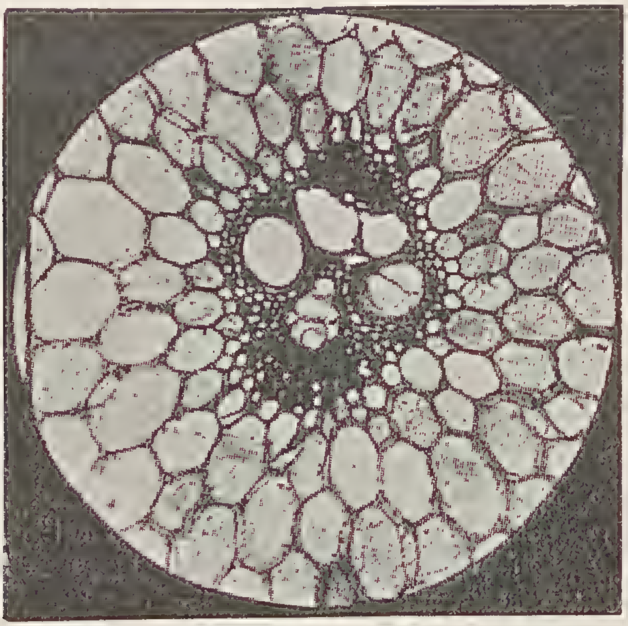


Longitudinal and Cross Sections of Sugar-cane.

notes have been prepared. Of these, Fig. 1 is a longitudinal section of the interior of the sugar-cane, showing the cells and tube through which the juice is diffused into them. (30 diameters.)

Fig. 2 is a transverse section of the same, but without showing the end of diffusing tube. (30 diameters.)

And Fig. 3 is a greatly enlarged photo. showing the end of one of the diffusing tubes, and clearly demonstrating that they have a number of inner tubes constituting what are technically known as vascular bundles. (70 diameters.)



Cross Section of End of Sugar-cane showing Vascular Bundles.

From the latter it will be seen the smaller cells appear to radiate from these bundles, and gradually growing more and more distended with juice are displaced by succeeding ones, and thus pressed further from the source of supply. When the sugar-cane is under pressure these cells discharge their contents, but, sponge-like, they rebound, on removal of pressure, more or less to their natural size. The writer has often noticed (especially on single low-pressure crushing-mills) the stream of juice running back to be reabsorbed by the expanding megass and lost as a source of sugar. If practicable, it would be desirable could engineers devise some vacuum suction attachment that would draw this juice from the roller. The walls that form these cells are not woody indigestible fibre, but digestible cellulose. On analysis they are found to be digestible to the extent of 75 per cent.; therefore they have a feed value for animals, and as a medium for absorbing the molasses nothing could be better. The first experiments confirming this were made at Rose Hall Estate, British Guiana, where the greatest assistance was given by Mr. Strang, the then buildings manager. He and the writer found that 15 per cent. of the fine dry "Cush Cush," as the fine cellular matter is called, that had settled about the factory was capable of completely absorbing 85 per cent. of molasses. It is not desirable, however, to make molascuit, as first suggested, with the maximum of molasses possible, because it subsequently proved on shipment to be liable to set or cake in lumps. The article is sold to the British farmer as a meal suitable for mixing with his other feeds, which has not always been possible in the condition it arrived; in fact, like any new industry, it has had

to pass through experimental stages. It is to be anticipated, with the latest formula of 25 per cent. of finely screened megass meal, 75 per cent. of molasses, and the product dried to a maximum of 15 per cent. moisture, that these defects will be overcome.

The remarks made by Mr. G. Hughes at the East Sussex Farmers' Club may bear repetition, viz.:—

"Everyone knows that sugar pure and simple cannot be taken in any quantity at a time, because, all being soluble at once, it would nauseate and upset the digestion, but I will show you that molascuit slowly gives up its saccharine matter in a simple experiment by mixing water and decanting; when water is poured upon the sediment, you will note it still yields sweetening matter. It is, therefore, practically a natural food, made entirely from the one product, the sugar-cane, almost in its natural state, only the cells charged with concentrated molasses instead of original juice."

In conclusion, there is no reason to doubt a future awaits this new product, judging from the opinions expressed by eminent agricultural chemists, and amply confirmed by those feeding stock on molascuit in this and other countries.—*West India Committee Circular.*

CITRONELLA OIL.

Much interest is being taken in many countries, especially in Ceylon, in the somewhat important industry of the distillation of oil from the Lemon Grass (*Andropogon schœnanthus* and *A. nardus*). In Ceylon there are two forms of Citronella Grass, the wild and the cultivated. The former, *A. nardus*, occurs on immense tracts of uncultivated land in the interior, up to 5,000 feet above the sea. The cultivated variety is *A. citratus* or *A. schœnanthus*. The former is a native of Bengal, and is cultivated for the distillation of oil on a large scale only on the Malabar coast in Travancore, whence the oil is exported in common wine bottles. In 1902-3, 33,684 bottles were shipped thence to Europe. Of late there has been a considerable rise in the value of citronella oil, prices increasing from 9d. to about 1s. 1½d. per oz. At present the standing price may be quoted as 1s. per oz., and it is said that pure oils cannot be produced at a lower price. In 1904 the shipments to Europe, India, and Australia amounted to 710,071 lb. According to Messrs. Schimmel and Co.'s report, stocks of any importance exist nowhere—on the contrary, the demand exceeds the supply; hence, say these oil merchants, a decline in price is inconceivable. Large quantities of citronella oil are used up in the manufacture of geraniol, in the manufacture of soap, and also of fresh grease for the re-extraction of the perfume in the form of an essence by means of the "Enfleurage" process. In this latter form, as well as in that of oil, it is much passed into use as essence or oil of verbena.

When first distilled, the oil is of a high colour, owing to the resin which it contains, and in this stage is known in commerce as lemon grass oil. By redistillation with charcoal, it becomes clear, and is passed into consumption as citronelle.

The leaves and roots may be kept for a long time without losing their virtue. They used to be brought from Turkey to England in bundles about a foot long. In Waluvanad, in Malabar, there are eleven stills. These stills are locally made of copper, the boiler being 6 feet high and 12 feet in circumference, and fitted at the top with a cover which is attached to a cask by means of a pipe. The steam passing through the pipe is condensed in a vessel attached to the end of the pipe. In the condensed water the oil is held, and it is removed thence and bottled. The stills cost from 200 rupees (£13 6s. 8d.) to 250 rupees (£16 13s. 4d.) each. I gather that a grass-cutter is paid 2 as. (2d.) for cutting down and bringing in a bundle of grass sufficient to make a decent headload. About sixteen such bundles are put into the still, and they yield

about a bottle of the distilled oil. The Moplan distillers send down their oil chiefly to Cochin, where the native merchants, I am told, pay very well for it. Mr. Barton Wright, who owns one of the distilleries, sends his stuff down to Ferokh, where it is once again filtered prior to exportation to Europe. The natives of Ernad and Waluvanad empirically distinguish no fewer than twenty-seven species of lemon grass, but say that only five of these varieties possess a commercial value. They also state that the most valuable of these varieties does not blossom. Ernad and Waluvanad are full of hills on which lemon grass grows wild, and could be had virtually for the collecting.

It is almost needless to say that citronella oil is frequently adulterated, and that in the most unheard-of manner. To the usual method of adulteration with kerosene has now been added that with camphor oil. The fine unadulterated Java oil appears to have the most exquisite perfume, and is used for the finest of honey soaps.

Apart from the general analysis of oil of citronella, with a view to determining its purity, the great bulk of the oil on the London market is examined in order that it may be certified as passing the so-called "Schimmel's test." Pure oils of commerce give somewhat different results with this test, some being quite soluble in 80 per cent. alcohol, and others, although quite soluble in 3 or 4 volumes of the alcohol, become slightly turbid on addition of 10 volumes of the solvent. This test allows, it would appear, of an adulteration of about 15 per cent. of petroleum. Some hold the belief that resin is used as an adulterant, but this is unlikely, and whatever resin-like adulterant may be present in the oil is attributed to the use of cheap Russian petroleum.—*Exchange*.

Mr. M. Kelway Bamber, Government Chemist (Ceylon?) has, says the local *Times*, hit upon an absolutely reliable test for detecting adulteration in citronella oil, as follows:—

You take a certain quantity of a pure fatty oil insoluble in alcohol. The citronella oil to be tested is added; and the oils are mixed and shaken up for 1 minute with 10 volumes of alcohol of a certain strength. The mixture is then put into a milk certrifugal machine and revolved for 1 minute, when the volume of fatty oil plus any adulterant from the citronella oil can be immediately read off and the percentage calculated. Four tests can be made in about 5 minutes. The idea is, if the test is approved by Government, to appoint, if possible, one or two Government inspectors to test all the oil at the Customs before shipment.

A demand has since arisen for the Queensland oil, and several inquiries have been made through the Department of Agriculture and Stock in the State as to whether its production has yet been undertaken on a commercial scale. We have not heard that such an industry has been initiated here.

BACKHOUSIA CITRIODORA.

Richer in "citral," however, than the lemon grass is the Queensland eucalyptus, *Backhousia citriodora*, which is plentiful in many parts of Queensland, notably in the Blackall Range scrubs, and at Gladstone. A sample of the oil from the leaves of this tree was prepared in July, 1904, by the Colonial Botanist of Queensland, Mr. F. M. Bailey. The sample weighed about 2 lb., and was forwarded to the Imperial Institute in London for analysis and report. In colour, the oil was of a greenish-yellow, and the liquid was slightly turbid, owing to the presence of a small quantity of water. The latter readily settled out on standing, leaving a bright transparent oil. It had a strong odour of citral. The oil was missible, with 80 per cent. alcohol in all proportions, and was completely soluble in 2.25 times its own volume of 70 per cent. alcohol. The amount of citral in the oil was found to be 93.5 per cent. This shows that this oil is one of the richest known sources of the odorous substance citral, since the East Indian and Ceylon lemon grass oil, the principal source of citral at present, contain only from 70 to 80 per cent. of this material.

On Mr. Bailey's oil being submitted for commercial valuation to two London firms dealing in volatile oils, one firm stated that the oil would be worth as much as pure lemon grass oil—viz., about 7d. per oz., c.i.f. London, whilst another was of opinion that it would be saleable in London at 9d. to 9½d. per oz. If oil containing as high a percentage of citral could be regularly placed on the market, it is highly probable that the higher price could be secured. One of the firms consulted stated that there would probably be a considerable commercial demand for this oil, and that they would be glad to make an offer for a trial shipment of it.

Some idea of the extent of the demand for oils containing citral may be obtained from the following figures, showing the export of lemon grass oil from the Malabar coast of India, which is the principal centre of production:—

1900-01 ...	1,933 cases	Each case contains approximately 2 gallons of oil.
1901-02 ...	2,322 cases	
1902-03 ...	2,807 cases	

COST OF GINNING, BALING, AND SHIPPING ONE POUND OF COTTON AT BARBADOS.

The *Barbados Agricultural News* has received the following statement from Mr. J. R. Bovell, F.L.S., &c., Agricultural Superintendent at Barbados, showing the expenses incurred in ginning, baling, and shipping 1 lb. of Sea Island cotton. The statement is prepared from the returns obtained from the 40 bales (containing 13,947 lb. of lint) shipped by the R.M.S. "Tagus" on 25th February last. The ginning and baling have been charged at 1½c. per lb.:—

	Cents.	
Expenses at Barbados—		
Ginning, baling, &c. ...	1·500	
Marine insurance, at £18 per bale ...	·139	
Cartage, at 1½d. per bale ...	·009	
Lighterage, at 5d. per bale ...	·029	
		1·677
Expenses in England—		
Discount, at 1½ per cent. ...	·480	
Dues ...	·014	
Quay porterage ...	·017	
Freight, at 17s. 6d. per ton measurement ...	1·313	
Attending ship, cartage, housing, mending, stowing, delivery, &c. ...	·103	
Warehouse rent ...	·009	
Fire insurance ...	·022	
Interest and bank commission on freight, &c. ...	·007	
Brokerage, at 1 per cent. ...	·320	
		2·285
Total expenses ...		3·962

The total expenses, it will be seen, are 3·962c. per lb., or, say, in round numbers, 4c. or 2d. per lb.

THE CULTIVATION OF SISAL.

The sisal hemp of commerce is a product of one of the Agave family, belonging to the natural order Amaryllidæ. There are several species, and all were originally natives of Central America, and chiefly of Mexico, whence the name sisal grass of Mexico. They are now, however, widely acclimatised in most warm, temperate, or sub-tropical and tropical countries. They take

several years to reach the flowering stage, and from the fact that in adverse circumstances their development may be retarded from 10 to 50, even to 100 years, they are popularly called the "Century Plants."

Varieties.

There are, as stated, several varieties of the sisal hemp plant (*Agave rigida*), seven of which are grown for commercial purposes in Yucatan, Mexico, but the three chief ones from which the sisal hemp of commerce is extracted are:—

(1) *Agave rigida*, var. *elongata*, of a greyish-green colour, with thorny spines on the edges of the leaves.

(2) *Agave rigida*, var. *sisalana*, of a dark-green colour, having no spines on the edges of the leaves, the absence of which facilitates handling.

(3) *Agave Heteracantha*, known as "Ixtl" in Mexico, is largely used in the manufacture of nail and scrubbing brushes, for which purpose a very great demand exists for the fibre. It is also used in the manufacture of corsets and of artificial flowers.

A fourth variety, called Pita or Maguey, is derived from *Agave americana*, and yields a finer fibre than the latter. Although the Agaves in Mexico are grown to a large extent for the sake of their fibre, yet enormous numbers of plants are merely cultivated for the production of the national beverages, "Pulque" and "Mescal." The latter is a coarse, fiery spirit, stronger than whisky, but with much the same flavour. Pulque has the appearance of clear, light beer. In some districts it is milk-white. Its effects are much like those of opium. It is the great national drink of the Mexicans, and is produced in enormous quantities. The spirit is distilled from the young bud of the flowering pole as it emerges from the centre of the leaves. For the production of Pulque, the young pole bud is cut out and the head of the plant is hollowed into a basin, in which the sap collects. The basin will hold about six pints, and the sap is bailed out several times a day by sucking it through a reed. Pigskins are used for casks. When the reed is full, the workman closes the hole with his thumb, and empties the liquid into the pigskin. When a skin is full, a little old sour beer is added, and the skin is sewn up. After exposure for fifty hours to the sun, the Pulque is ready for sale. Thousands of these skins filled with the liquor are daily sent to Mexico and other cities by train. When the plant has yielded all its sap, it is cut down, the leaves are treated like hemp, and the resulting fibre is used in Mexico for paper-making, for mats, hammocks, ropes, &c.

In the Mauritius, the plant furnishing what is known commercially as Mauritius hemp is the *Fourcroya gigantea*, or, popularly, the Green Aloe. This plant is, erroneously, supposed to be an Agave. It belongs, however, to the same natural order as the Agave—viz., Amaryllidæ.

This Fourcroya is found in all parts of the coast lands of Queensland, and wherever it has been introduced it has thriven as well as in its native Yucatan. Although not as valuable a fibre plant as the *Agave sisalana*, it is nevertheless of considerable commercial value, and in districts where the plant is acclimatised it seems folly not to utilise it. The plant grows like a weed. It is almost as hard to kill as the prickly pear, and it produces a mass of fibre which can be sold in any quantities in the home markets for £30 per ton.

Of the seven varieties of the Agave plant cultivated in Yucatan, the best is that known as "Sacqui"—meaning white in the Indian dialect, owing to the light-green colour of its leaves. This variety possesses all the best attributes of a fibre plant—viz., abundance, flexibility, whiteness, strength, length, and weight. The leaves of all the varieties vary in size, from 5 to 7½ feet in length by from 4 to 7 inches in width. The plant has many names in Yucatan, such as "Henequin" in Spanish and "Sacqui" in Indian. Doctor Perrino, who

introduced it into Florida, gave it the name of *Agave sisalana*, simply because the principal port of Yucatan from which the fibre was at the time exported was the port of Sisal. In Cuba it is known as the "Maguey."

Soil.

There is no known plant which will thrive so well and yield such large returns on poor, impoverished-looking, dry, rocky soils as the sisal hemp plant. Except on absolutely barren sands, it will thrive in any kind of soil, the sole condition being that the latter be dry or thoroughly well-drained. It is waste of labour to plant it on wet soils. On rich agricultural land it will thrive most luxuriantly, but the fibre will be inferior to and less in quantity than that from plants grown on poorer, arid land. This is, however, open to question, and well-to-do planters in Mexico are utilising fairly good lands for new plantations. They believe that the roots are able to extend more rapidly, and that the plant will therefore grow quicker and yield larger leaves and a finer fibre. There are hundreds of acres in the neighbourhood of Brisbane alone which would yield rich returns if planted with sisal hemp instead of being overrun with wattles and lantana. The writer a couple of years ago tried, in conjunction with a prominent resident of Coorparoo, South Brisbane, to introduce the cultivation of the plant into that district, but was met with the usual incredulity and apathy. No one could be induced to believe that those wretched gravelly soils would grow anything but stunted gum-trees and wattles. The result is that, where owners of such property could now have been getting good returns from their unused lands, they are paying more than they are otherwise worth in rates and taxes.

Preparation of the Land.

The land requires no preparation whatever prior to planting. No ploughing or harrowing is needed. The land should be laid out in blocks, with roads between for the passage of drays when harvesting. Holes are dug in rows 11 feet apart, and from 6 to 7 feet apart in the rows. This will give 650 plants to the acre, but the distance apart must naturally depend upon the soil. On fairly fertile land the plants should be set 10 feet apart every way, and on very poor land even 8 feet by 6 feet is not too close. The object of giving plenty of room is that the leaves may not be wounded by being pierced by the spikey pointed leaves of the neighbouring plant. A leaf injured in this manner will either die or the fibre will suffer injury.

Planting.

The Agave may be propagated from seed or from suckers. Suckers should be preferred, as the returns are obtained a year or two earlier than when the plants are raised from seed. In removing young plants from the nursery, and before planting them out, the roots must be cut off right up to the stem, and any dry leaves pulled off, exactly in the same manner as pineapple suckers are treated for planting out. The young plants must be planted perfectly upright, for it put in slantwise they grow out across the rows, and there is no getting between them to gather the leaves which ripen first.

Cultivation.

Once the plants are put in they may be practically left to themselves. Should weeds be troublesome in the early stages of growth, these may be hoed down, but soon the plants require no attention. The simplicity of the cultivation may be conceived from the statement by a writer who had been in the business in Central America, that there is not a hoe or spade, harrow or plough, employed in its cultivation in all Yucatan. When the plants are from three to four years old, any stock, excepting perhaps goats, may be turned in to keep the weeds down. They will have nothing to say to the Agave with its pointed spear. Whilst the plants are still young, however, they should be

protected from stock, not from any fear that they will be eaten, but to prevent their being knocked out or trampled down. A plantation, therefore, should always be fenced in.

HARVESTING.

The Agave will yield full returns in four or five years, but harvesting may be begun in three years after planting. The ripened lower leaves are cut off, and every four months the same operation may be repeated. When the leaves are ready for cutting they incline downwards to a horizontal position, and become darker in colour. Care must be taken to cut the leaves from the bottom upwards, and to cut close to the stem. If the *Agave rigida elongata*, the variety having spines on the edge of the leaf, is being harvested, the spines must be trimmed off each leaf to facilitate handling. The leaves are usually tied in bundles of 25 or 50, point to butt alternately, and carried to the headland, when the drays take them up. One man can cut and tie up 1,200 leaves per day on an average. The knife used for cutting is an ordinary sheath knife with an 8-inch blade.

LIFE AND YIELD.

The life of the Agave plant is a comparatively long one, but this long life may be shortened by careless or injudicious management. If the plant is allowed to send up a pole, it is ruined for fibre production. The pole on which the flowers and seeds are borne will run up to a height of 30 or 40 feet. Regular cutting of the leaves retards the production of the flower pole, and will prolong the life of the plant to fifteen years and more. About every two years numerous shoots spring from the roots, and these may be either used to form fresh plantations or may be destroyed. When the Agave has completed its fifteenth year, it may be cut down, but one of its root shoots must be left to take its place. Thus the original area planted will never require to be replanted, whilst large numbers of young plants are produced to form new plantations.

Now as to the yield. I will place before the reader the statement of Mr. Quennel, published in the *Journal of the Jamaica Agricultural Society* about four years ago. Mr. Quennel says:—I take for planting 5 rows in 36 feet—that is to say, 4 at 6-feet distance, and 1 at 12. I put the plants 6 feet apart in the rows. This gives me more than 1,000 plants to the acre. (It will be observed that Mr. Quennel allows for much closer planting than I have allowed for.) Each plant, at four years, gives forty leaves a year of a weight of 50 lb., of which 4 per cent. turns into fibre, dried and white, or 2 lb. of fibre to a plant, or 2,000 lb. to an acre. The fibre plant gives a hemp of a value of £30 a ton in London, which Mr. Quennel reduces to £14 a ton, after allowing for all possible expenses, including cultivation and packing. £14 a ton is more than 3 cents (1½d.) per lb. He allows only 2½ cents (1¼d.) per lb. to make 50 dollars (£10) an acre. Thus, an acre producing a net profit of £10 yields double the results of 200 cacao-trees on an acre, at 10 bags per 1,000 trees at 12 dollars (£2 8s. 4d.) net, when the London price is 65s. It is a great deal more than 20 tons of sugar-cane to an acre at 9s. per ton (from which all expenses have to be deducted).

I will take another authority quoted by Mr. P. McLean, Agricultural Adviser, in his article on sisal hemp in this *Journal*. He says:—"Each robust plant is capable of yielding from 25 up to 100 leaves per annum. Hence, 1 acre containing 600 plants will produce from 15,000 to 60,000 leaves per annum. The average yield of dry fibre from 100 leaves is 4 lb.; therefore, 1 acre will yield from 600 lb. to 1 ton of fibre. Frequently 1½ tons per acre have been realised, and with the latest improved machinery from 2 tons to 2½ tons per acre may be realised. The working expenses have been usually averaged at about 30 per cent. of the value of the fibre produced per acre. Therefore, taking an average yield of 1 ton of fibre at, say, £40, and from this deducting 50 per cent. for working expenses, it will be seen that the net

profit is £20 per acre." (The value of sisal hemp at present—1905—in the London market is from £32 to £35 per ton.) In a pamphlet on sisal hemp, Mr. D. J. Stoddart says: "Many farmers' annual incomes are from £100 to £400 from sisal hemp," planted in out-of-the-way places on the farms.

The usual price of sisal hemp is £33 to £35 per ton, and the price is regulated by that of Manila hemp, which has lately been very high. In 1902 some sisal fibre, grown at St. Helena Penal Establishment, was sent to Melbourne, and was reported on by Messrs. James Miller and Co., rope and twine manufacturers. The report stated that it was "of very superior quality, and worth about £35 per ton." These gentlemen also stated that there is a market in Melbourne for 2,000 tons of sisal hemp annually. Now, if we put the value of hemp grown in Queensland at £35 per ton, and deduct as much as 50 per cent. for working expenses, there still remains a profit to the grower of from £17 10s. to £26 5s. per acre.

The price of the fibre fluctuated greatly at one time from various causes. In 1888 and 1889, owing to the formation of the National Cordage Trust in the United States, and the efforts made to control the entire supply of white-rope fibres, the price of sisal was extraordinarily high. This was a purely artificial state of things, and had no reference to the ordinary market value of the fibre. The average price in 1887 was £33 per ton. In the beginning of 1888, it rose to £36 10s., and towards its close it went up to £45 per ton. In January, 1889, it brought £50 per ton, and in March reached a maximum of £56 10s. per ton, in London. Then prices fell, until in 1890 fair fibre could be bought for £27 10s. per ton. In 1891 the price dropped to £23 10s.; in 1893 to £20; in 1894 to £15; and in 1895 it reached the lowest price it ever attained. This was £13 per ton. Since that time the price has constantly improved. It would appear as if the increase in price kept pace with the increase of production, as will be seen from the following table:—

Year.	Price per Ton. £	s.	d.
1897	16	6	8
1898	27	18	4
1899	34	4	2
1900	35	8	4
1901	32	11	8
1902	43	1	8
1903	36	6	8
1904	40	6	8
1905	35	0	0

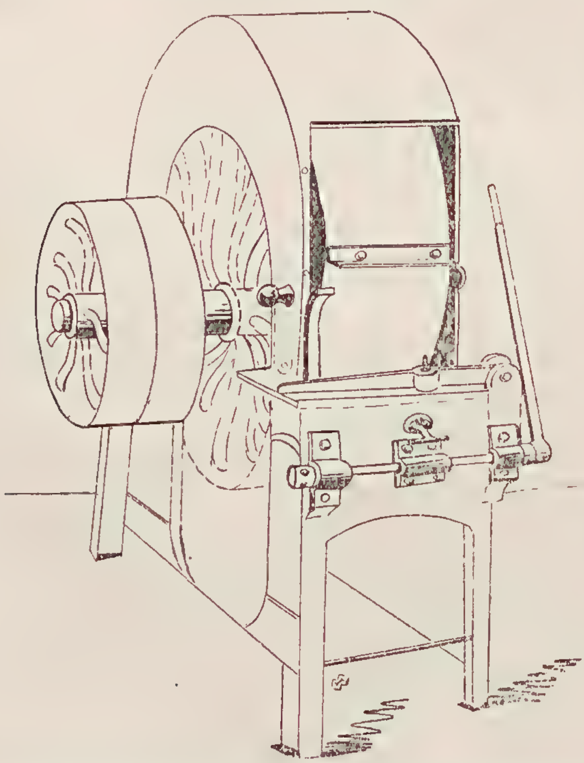
Extraction of the Fibre.

Notwithstanding the constant advocacy of the industry, both by official and private agricultural and other journals, farmers have hesitated to plant owing to the fear that expensive machinery is required. This is quite a mistake. There *are* expensive machines, costing, with boiler and steam engine, up to £1,200, turning out three-quarters of a ton of fibre per day. But there are other machines, called "Raspadors," universally used in all countries where Agave fibre is produced, and which are kept on large estates even, in the event of any breakdown of the big machinery. A raspador can be bought as low as £30, and such a machine will turn out 333 lb. of clean dry fibre in ten hours. Raspadors have been greatly improved upon. In Yutacan and Mexico they are largely in use. One of these is sufficient to work off 100 acres of leaves annually. In Mauritius, a machine called the "Gratte" is used. Both the names of the machines signify "raspers" or "scratchers." The "Raspador"

consists of a large-toothed wheel which scrapes the pulp away and leaves the fibre. The following table will show the kinds of machines in actual use in Yucatan :—

Machine.	Number of Leaves cleaned in 10 hours.	Actual Horse-power.	Number of Men needed.	Cost of Machine.		English Money in round numbers.	Number in Use.
				Mexican.	United States.		
				†Dollars.	Dollars.	£	
Lanaux	130,000	35	3	6,000	2,856	571	6
Prieto	125,000	60	3	7,000	3,332	664	90
Stephens	150,000	70	3	11,000	5,236	1,047	6
Solis (Raspador) ...	9,000	6	2	250	119	24	1,200
Torroella	80,000	30	3	5,000	2,380	476	20
Villamor	70,000	35	3	6,000	2,856	571	?
Death and Ellwood	20,000	3½	2	1,365	650	130	?

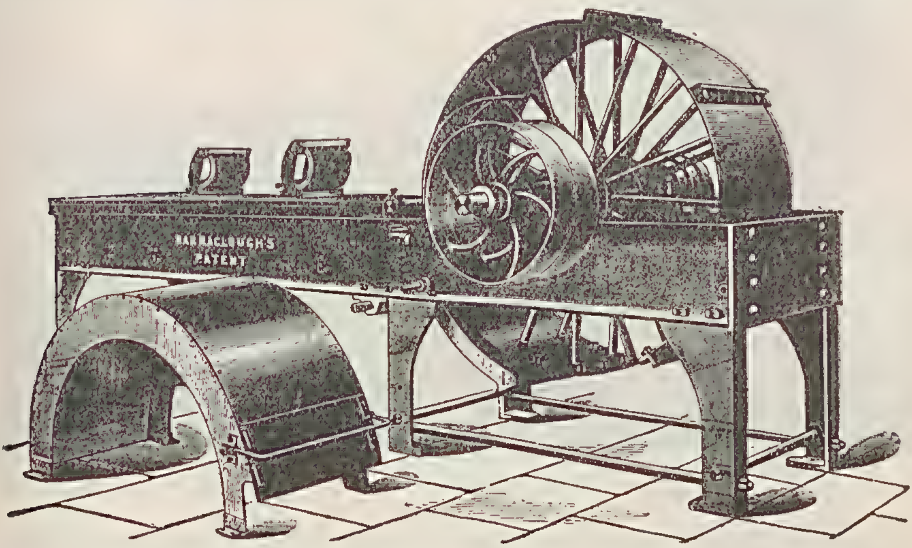
The average work of a Raspador is said to be 7,000 leaves per day, with two men continually engaged in feeding it. The machine is simply a wheel, 4 feet in diameter and 6 inches broad. At every foot in the face of the wheel are brass or gun-metal bars, 1 inch square and 6 inches long, fixed firmly across the face. The wheel works in a case, to prevent the workmen being splashed by the acrid juice, which causes a painful burning sensation. The wheel revolves at about 200 revolutions per minute. The leaf is pushed through a small opening at one end of the casing, and is held firmly by a clamp or even in the hand. A kind of brake, worked by the foot, works a heavy block against the leaf, thus pressing it against the wheel. In a few seconds the pulp is beaten out by the bars on the wheel. Then the leaf is reversed, and the other half treated in the same manner. Such primitive machines are used by hundreds in Mexico and Mauritius, but the new fibre companies of the Bahamas



THE BARRACLOUGH "SIMPLEX" FIBRE-SCUTCHING MACHINE.

and Hawaii require something better, and hence there have been invented more elaborate and more expensive machines, amongst which the best are said to be that invented by Mr. T. C. Todd, of Patterson, New Jersey, U.S.A., and the Barraclough, invented and manufactured by Mr. Thos. Barraclough, of Bucklersbury, London, England.

The Todd machine is automatic, the leaves are only handled once, and are cleaned by two drums or scutching wheels working on alternate sides. They are fed at one end, and the clean fibre is delivered at the other. Only one boy is needed to arrange the leaves on the feed-table. They enter the machine sideways instead of endways, as in the Raspador. It is claimed that 40 to 60 leaves can be cleaned in one minute, and that 1,500 lb. of fibre can be turned out by it in a day. The power used to drive the machine is either a steam



THE BARRACLOUGH FIBRE-SCUTCHING MACHINE WITH AUTOMATIC FEED TABLE.

or oil engine. A Todd machine, steam engine, and steam press would cost about £1,000. The Barraclough machine is cheaper, but very effective. These machines are made in three sizes, prices and horse-power required for which are—

£ s. d.	H.P. required.	Diameter of Wheel. Inches	Width of Wheel. Inches.
39 15 0	2	48	14
34 10 0	2	48	12
32 5 6	1½	48	8

An automatic feed apparatus can be atached to a special fibre-extracting machine for larger works. The cost would be, for machine and automatic feeder, £83 10s. The cost of the special machine, to turn out 3,150 lb. of clean fibre per day, would probably equal the cost of the Todd machine. The machines of which the price is given will turn out from 600 to 1,236 lb. of clean fibre per day.

The Villamor machine is much used in fibre-producing countries, and is highly reported of at the Bahamas and in Yucatan.

Barraclough's 40-ton screw packing-press, to work by hand or belt power, costs from £70 to £85.

The " Death " machine is about as perfect a machine as can be got for its cost—£130. It has an automatic feed-table, requires a 3½-h.p. engine to drive it, and will turn out about 500 lb. of clean fibre per day. There are at present only two fibre-scutching machines in the State—viz., a Lehmann Raspador, imported by the Department of Agriculture and Stock; and a

"Death" machine, owned by Major A. J. Boyd. The largest plantations in the State, so far, are those of Mr. T. H. Wells, of Farnborough, Childers

THE DEATH AND ELLWOOD FIBRE-SCUTCHING MACHINE.

(about 15 acres), and that of Major A. J. Boyd, at Woolhara Park, Broadwater, near Mount Gravatt (about 19 acres). It is the intention of the latter to continue planting up to 200 acres. In both cases the prospects are very good.

PRESSING AND BALING.

Each bale should weigh from 350 to 400 lb. The cubic measurement is from 20 to 22 feet. According to size and weight of each bale, from 4 to 6 bands of rope or galvanised-iron wire are put on. The fibre should be compressed to the utmost to save shipping charges, which are not calculated on the weight but on the cubic space taken up by the bale. In Hawaii, bales are of two sizes—250 lb. and 500 lb.

The sisal industry would appear to be in a fair way of being established in Queensland, several small plantations besides those mentioned having been started within the past two years. The trouble with most new industries has been that those who first experimented started with too large ideas of the returns and too low an estimate of expenses. This is what must be avoided. If the yield of a field of sisal in the third or fourth year amounts to £20 per acre, not only must allowance be made for that third or fourth year's expenses, but also for the expenses, or a percentage of them, at least, from the first day of preparing the land to the shipping of the first ton of fibre.

The fear expressed by some of low prices owing to over-production is groundless, as has been shown by the tables of prices for several years past.

After passing through the machine, the fibre is hung out to dry in the sun, after which it may be hung in the shade for twenty-four hours before baling, to bleach, as it has a slight green tinge before drying. When perfectly dry, the fibre, which must be kept clean and straight, is taken to the press, which must be 5 feet long, so that the fibre may be laid evenly without

doubling over. The net weight of the bale should be 250 to 300 lb. In the event of the baling press not being ready to work at the beginning of harvest, the fibre must be carefully shaded from sun, rain, or heavy dew; otherwise it loses its lustre, a very important quality.

SISAL HEMP IN THE BAHAMAS.

As to production, the Bahama planters are the latest to come into the field of competition. From returns published in the *West Indian Bulletin* in 1891, about 25,000 acres were then planted. Of this about 12,000 acres were productive two years later. In 1897 the export reached 6,000 tons. In 1902 the value of the exported fibre from the Bahamas was £37,574, or twice the value of the previous year's export, and in 1903 £38,805.

IN YUCATAN.

The latest consular report (1903) to the British Foreign Office has the following remarks on the sisal industry of Mexico:—

"The growers have all become enormously wealthy, many of them being millionaires. Roughly speaking, what costs 1 dollar to produce sells for 4 dollars."

The British Consul at Mexico, Mr. Leay, justly asks, "Why could not this valuable fibre plant be introduced into our new African colonies?" We say, "Why has it not long ago been taken up in Queensland?"

The exports of fibre from Yucatan in 1903 amounted to 590,430 bales, of a value of 33,331,148 Mexican dollars, equal to about £3,333,114. In addition to this, Mexico exported binder twine to the value of £92,595.

IN MAURITIUS.

The export of aloe fibre, mainly the product of the *Fourcroya* or *Furcrea gigantea*, in 1903 amounted to 1,518,684 kilos (1,491 tons), of a value of 551,234 rupees (£45,936).

Seeing what is being done in these countries, it must be evident that Queensland has been, and still is, losing a golden opportunity for adding to her wealth. With the addition of sisal hemp to our exports of sugar, butter, gold, frozen meat, lambs, poultry, &c., this State would be one of the richest, if not the richest, of the States of the Commonwealth.

A COTTON OIL FACTORY.

A cotton oil factory is about to be established at Barbados. This is a proof of the confidence which is felt in the permanence of the cotton industry. The *Agricultural News* says, in connection with the new venture:—

"If 200 lb. of Sea Island cotton lint are obtained per acre, there would also be produced about 700 lb. of cotton seed. This, if shipped abroad, would realise, after payment of all expenses, about £4 to £4 10s. per ton. If, on the other hand, it is retained for extracting the oil and for feeding purposes on the spot, it is estimated that it will be worth about £6 to £7 per ton.

"It is probable that the total crop of Sea Island cotton to be produced during the current season will be about 3,000 bales of 360 lb. each, or 1,080,000 lb. The weight of cotton seed will probably amount to 3,724,138 lb. or 1,663 tons. The yield of crude oil amounts to about 45 gallons per ton of seed, so that, if all the seed were dealt with at an oil factory, the total output in crude oil would be 74,835 gallons.

"A common arrangement in the cotton-ginning districts of the United States is for the oil mills to offer 1 ton of meal for 2 tons of seed, including freight both ways. It is claimed that this arrangement is profitable to both

parties, as the meal contains substantially all the fertilising ingredients of the seed, and is in a form far more suitable for cattle food. For these reasons it would appear to be an arrangement which may be likely to suit the needs of the West Indian cotton planters."

Crude cotton-seed oil is worth in the London market about £15 per ton, and refined from £17 to £17 10s. per ton. At this rate, the seed alone from 1,080,000 lb. of cotton would yield over 3,000 tons of oil worth £45,000. The lint itself is worth, say, 15d. per lb., or a total of £67,500. Evidently the 'Badians are making hay while the sun shines. We hope next year to be able to record a crop of 1,000,000 lb. of cotton in Queensland.

SISAL HEMP.—LOSS OF LEAVES BY POLING.

The accompanying illustration, reproduced from a photograph taken by Mr. W. H. Mobsby, photographer to the Department of Agriculture and Stock, in the Brisbane Botanic Gardens, clearly shows the loss of leaves which ensues upon the poling of the sisal hemp or Fourcroya plant. At the time of sending up the flower pole, there are about 210 leaves still uncut on the plant. If the central bud, which develops into the flower pole, be cut shortly after its appearance, these leaves will be saved, and the plant gains a year longer of life. The tough and leathery leaves here shown drooping to the ground cannot be successfully machined for fibre. Two hundred 4-lb. leaves, such as are produced in the State, yield about 300 oz. or, say, 20 lb. weight of fibre. The advantage of cutting off the flower stalk, except in cases where plants are required, is therefore obvious.

PROFITS ON A SMALL RUBBER ESTATE.

The following paragraph was published in a local paper on 19th April, under the title "Where Is It?":—

"The *Ceylon Observer* publishes the following extract from a letter dated somewhere in Malaya—no need to specify—7th February, 1905:—'Unfortunately,' writes the correspondent, 'I have only 5 acres of rubber yielding at present. I get about 100 dollars per acre a month profit from them.' One is inclined to think 'If these things be done in the green tree?' But present prices remind one that there are places where angels fear to tread."

I visited at Easter the plantation probably referred to in the above paragraph. I have known the place from its commencement. The seeds were procured from our Botanic Gardens at Tanglin, and the young plants planted early in 1898, among old Liberian coffee, 12 feet by 12 feet apart, making about 300 Para rubber-trees per acre. The land is low-lying but not wet, and has been under cultivation for many years, formerly with gambier and afterwards with coffee. The soil is somewhat sandy. The rubber-trees are healthy, but not specially large in size, the girth at 3 feet from the ground varying from 20 to 36 inches, the average being considerably under 30 inches. The larger trees were tapped at five years old and afterwards, but from July, 1904, onwards the plantation has been regularly tapped at the rate of 150 trees per month. The average return to end of March has been 75 lb. dried rubber per month or, say, ½-lb. per tree.

The monthly expenditure is 50 dollars, including wages of four coolies employed in tapping, curing, weeding, &c., so that at last year's prices the profit exceeded 100 dollars per month. The owner expects that this year, with increasing yield from the 1,500 trees and prices at 3 dollars per lb., that the monthly profit will amount to 200 dollars.

There are no white ants, nor any trace of fungal or any other disease on the trees. The figures speak for themselves.

There have not been many cultivations which have returned so large a profit on so small an expenditure.—H. N. Ridley, in the Agricultural Bulletin of the Straits and Federated Malay States.

Plate VI.

FLOWER POLE OF *Fourcroya gigantea.*

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

Third Lesson.

Carbonic Acid, Carbon, Assimilation or Carbon Fixation of Plants, Combustion and Destructive Distillation.

In our Second Lesson we have already learned that carbonic acid gas is one of the components of our atmosphere, and that it is a constant product of the combustion of any organic compound, by the carbon of such compound combining with the oxygen of the air. In order to understand this compound properly, we must commence this lesson with a short study of the element Carbon.

Carbon.—This element is very widely distributed in Nature, and occurs free and in combination with other elements. Carbon forms the basis of all *organic compounds* of the animal and vegetable kingdom. In the mineral kingdom we find free carbon and compounds in the form of carbonates in *Limestone* and *Chalk*, both carbonate of lime; in *Dolomite*, a mixture of carbonate of lime and carbonate of magnesia; in the form of *hydrocarbons* in *mineral naphtha, petroleum*, or *kerosene oil.*

Free carbon occurs in three modifications, or, expressed in other words, in three **allotropic forms:**

Diamond—Transparent, colourless, or slightly coloured modification of extreme hardness;

Graphite or Black Lead—Black, opaque, with metallic lustre, and soft;

Charcoal—Dull, black, porous, and soft.

Carbon is found in a state of more or less purity in **anthracite, bituminous coal, lignite or brown coal,** and in **peat**—all formed by a slow decomposition of buried vegetable matter.

Anthracite is the oldest, hardest, and purest product, containing from 90 to 95 per cent. of carbon. Peat, or turf, is the youngest form, in which the vegetable structure is still clearly visible. Artificially produced forms of carbon are **wood** and **animal charcoal, lampblack, coke,** and **gas carbon.**

Graphite is familiar to all, being used in the manufacture of lead pencils. Black lead or plumbago are forms of less purity used in manufacture of crucibles and as a lubricant to minimise friction of machinery. Graphite is a good conductor of heat and of electricity. Graphite only burns when strongly heated in oxygen.

Charcoal is an **amorphous** or *non-crystalline* form of carbon, is a bad conductor of heat and electricity, and burns when heated in the air, without flame or smoke. Charcoal has the remarkable power of absorbing large quantities of gases and vapours and also colouring matters from many solutions. This property is taken advantage of in the use of animal charcoal filters in sugar refineries for the decolorisation of sugar juices, and in the use of charcoal for the purification of drinking water.

With oxygen, carbon forms two compounds:—

Carbon monoxide, CO.

Carbon dioxide, CO_2, or **Carbonic acid gas.**

Carbon monoxide is a colourless, tasteless gas, having a peculiar faint smell, and burns easily in the air with a characteristic pale-blue flame, under formation of carbonic acid gas—

$$2CO + O_2 = 2CO_2.$$

This flame is always noticeable in charcoal or in coke fires burning without a sufficient supply of air. The gas is extremely poisonous, by its powerful action on the blood, and even small quantities present in the air cause giddiness, followed quickly by insensibility and death. As the gas is formed when charcoal or coal is burned without sufficient draught, the use of small braziers in close rooms is always dangerous.

Carbon Dioxide or *Carbonic Acid Gas.*—This gas is, as already stated, a constant and also important component of the atmospheric air, being present at the rate of about 3 volumes in 10,000 volumes of air. During night-time this quantity is slightly greater than in daytime, as the plants do not absorb the gas at night-time. Carbonic acid is always found in larger quantities in the gases escaping from active volcanoes and from fissures in the earth in volcanic districts. The gas is also always present in the soil in quantities increasing with the depth, and is found dissolved in spring and well waters, and in larger quantities in certain mineral and bore waters. The air in cellars and deep wells is always richer in carbonic acid gas, and we have already learned that the gas, if present in sufficient quantities, may become dangerous to human beings.

Carbon dioxide is easily prepared by the action of an acid on a carbonate, as, for instance, dilute hydrochloric acid on marble chips *(Experiment 16)*, in an apparatus shown in Fig. 3A. The following reaction takes place:—

$$\underset{\text{Marble or carbonate of lime.}}{CaCO_3} + \underset{\text{Hydrochloric acid.}}{2HCl} = \underset{\text{Calcium chloride.}}{CaCl_2} + H_2O + CO_2.$$

When marble or limestone are strongly heated, a decomposition or splitting up into Calcium oxide and Carbon dioxide takes place *(burning of lime in limekilns)*.

$$\underset{\text{Calcium carbonate.}}{CaCO_3} \text{ heated} = CO_2 + \underset{\text{Calcium oxide or burnt lime or quick lime.}}{CaO}.$$

Carbon dioxide is a colourless gas, having a faint acid taste and slightly pungent smell. The gas is slightly soluble in water, and this solution may be regarded as true **Carbonic acid**—

$$CO_2 + H_2O = H_2CO_3.$$

If we pass a stream of carbon dioxide through distilled water, we will notice that the water, which at first had an absolute neutral reaction, will afterwards have a slight acid reaction, turning blue litmus paper red *(Experiment 17)*. If the gas is forced into water contained in closed vessels and under pressure, we obtain **Sodawater**, which gives off carbonic acid when poured out.

Carbonic acid is much heavier than air, and can be poured like a liquid from one vessel into another *(Experiment 18)*. Carbonic acid gas will extinguish a flame. This may be shown by pouring the gas out of a jar on to a burning candle or on to a little dish containing burning turpentine *(Experiment 19)*. This property is made use of in the construction of various apparatus to extinguish fires, and also in the smothering of fires in mines and in ship-holds, without the use of water, by simply filling the place with carbonic acid gas.

By passing the gas into a solution of limewater we obtain, as already seen in an earlier experiment, a precipitate of carbonate of lime; but, if we continue the process by passing more gas through, we will notice that this precipitate again dissolves, and we obtain again a clear solution, which, however, deposits the carbonate of lime again on being heated to boiling *(Experiment 20)*. In

this chemical reaction the **Carbonate of Lime** first precipitated takes up more carbonic acid, and forms **Bicarbonate of Lime.**

$Ca(OH)_2$	+	CO_2	=	H_2O + $CaCO_3$.	
Calcium hydroxide.	+	Carbonic acid.		Calcium carbonate.	(Insoluble in water.)
$CaCO_3$	+	$CO_2 + H_2O$	=	$CaH_2(CO_3)_2$.	
Calcium carbonate.	+	Carbonic acid.		Calcium bicarbonate.	(Soluble in water.)

$CaH_2(CO_3)_2$ boiled in solution = $CaCO_3 + H_2O + CO_2$.

A similar process takes place in Nature when water passes through the soil. With the help of the carbonic acid dissolved in the water, the carbonate of lime present in the soil is dissolved and carried away in solution with the water, and makes this mineral matter available to plant life by being taken up through the roots.

The supply of carbonic acid in the air is maintained by the burning of coal, wood, and other organic substances, fermentation and putrefaction, decomposition of carbonates, and by the process of respiration.

Assimilation.—Carbonic acid is the principal source from which the plants derive the large amount of carbon which forms more than half of their dry weight, and this gas is consequently one of the principal plant foods. In a growing plant three distinct processes take place constantly—

1. **Respiration**—Taking up of oxygen from the air and giving out carbonic acid, similarly to the respiration of animals;
2. **Transpiration**—The water which was absorbed by the roots is taken up through the stem to the leaves, and given off by evaporation;
3. **Assimilation or Carbon Fixation**—A process by which the carbonic acid gas is taken up from the air; the carbon fixed and changed into carbohydrates, as sugars, starch, &c.; and the oxygen again allowed to escape to the air. This most important process of plant life takes only place if the following conditions are fulfilled:—
   - (*a*) The plant must live.
   - (*b*) Carbon dioxide must be present in the air surrounding the leaves.
   - (*c*) The leaves must contain chlorophyl, the green colouring matter of leaves.
   - (*d*) The plant must be exposed to the light.
   - (*e*) The plant must be exposed to a favourable temperature.
   - (*f*) The plant must have an ample supply of moisture, and be able to get a certain amount of mineral matters, chiefly potash and salts of phosphoric acid.

These three processes, above mentioned, take place through the numerous small openings, called **Stomata**, found on the surface of leaves. These openings are formed by a pair of peculiarly shaped cells, called the guard-cells (Fig. 3E), which leave a small opening between them, communicating with the tissue in the interior of the leaf.

When placing leaves of an aquatic plant or any other plant into a funnel filled with water, and immersed in another dishful of water *(Experiment 21)*, very soon bubbles of gas will be seen to escape from the leaves, which collect in the top part of the funnel, and which gas may be proved to consist chiefly of oxygen. In water containing no carbonic acid the process will not take place; the process will also stop if the leaves are kept in the dark.

In this process of assimilation the exact nature of the carbohydrates first formed is not known, and we may simply write—

Carbon dioxide + Water = Carbohydrates + Oxygen.

It is generally assumed that sugars, and more particularly cane sugar, are first formed, and as soon as enough cane sugar has accumulated in the sap of the cells starch grains are formed in the chlorophyl grains, called *chloroplasts*. Other sugars, as dextrose, levulose, &c., may subsequently again be formed.

All living plants fix, with the help of their green leaves, carbon, by taking up carbonic acid gas and giving off free oxygen.

Parasitic plants, however, form an exception—as, for instance, dodder, a parasite often found on lucerne—which absorb their carbon from the plants they live on in ready-formed sugars, proteids, &c.

Animal or vegetable organic substances when heated in the presence of air generally decompose with charring, and finally burn, leaving as a rule a small amount of mineral ash. A very rapid oxidation is called *combustion*, as we have already learned in a previous lesson.

A piece of wood heated in an open flame or in an ordinary fire will burn away, leaving only a small heap of ash *(Experiment 22)*. Heating a small piece of wood in a glass tube sealed at one end *(Experiment 23)*, we will observe that no true combustion takes place, but a decomposition, with formation of volatile combustible gases *(Hydrocarbons)*, leaving a residue of charcoal. This process is called **destructive distillation.** A similar decomposition takes place when heating other organic substances, as sugar, bone, meat, in closed tubes *(Experiment 24)*. The process of destructive distillation is utilised in the manufacture of *coal gas*. In this process coal is heated in retorts, in the shape of flattened cylindrical vessels, and yielding, as products of this distillation, coal tar—a watery liquid containing ammonia and other bodies—and coal gas, which, after purification, is used for lighting and heating purposes.

The formation of coal in remote geological periods is also a kind of very slow destructive distillation. The decay of vegetable and animal remains in the soil producing **humus** or vegetable mould, is a similar process.

Appendix to Third Lesson.

Allatropy is the capacity of a body of possessing different physical properties without a change in the chemical composition.

Fermentation and Putrefaction are processes resulting in the resolution of complex organic compounds into simpler substances with the aid of some living minute plants or animals.

Chlorophyl is the green colouring matter which permeates the Chloroplasts—small granular structures embedded in the peculiar jelly-like liquid cyto-plasm or cell plasm found in plant cells. Plants kept in the dark lose the green colour in their chloroplasts, and the leaves assume a sickly yellow colour. With the green pigment is always associated a reddish or a yellowish substance, which becomes more pronounced in autumn, when the leaves change their colour.

Carbohydrates are compounds containing six or some multiple of six atoms of carbon in combination with some multiple of the group H_2O—as, for instance, cellulose and starch, $C_6H_{10}O_5$, dextrose or glucose or grape sugar, $C_6H_{12}O_6$, cane sugar or saccharose $C_{12}H_{22}O_{11}$, levulose or fructose or fruit sugar $C_6H_{12}O_6$, maltose or malt sugar $C_{12}H_{22}O_{11}+H_2O$. These carbohydrates must not be mistaken for hydrocarbons, which are compounds of Carbon and Hydrogen only—for instance, methane or marsh gas CH_4, turpentine $C_{10}H_{16}$.

Humus, the organic matters of soil, formed from decaying vegetable and animal substances, is a very complex body, still imperfectly known. Many substances have been isolated from it, and several of these have a slight acid reaction and character—as humic acid, ulmic acid, and others.

Experiment 16.—A two-necked Wolfe's bottle is partly filled with marble or limestone chips (Fig. 3a). One opening is closed with a cork having a funnel tube nearly reaching to the bottom, and the other a cork with a glass tube to lead the gas into a glass jar, filled first with water and then inverted in a larger dish of water. On adding dilute Hydrochloric Acid (one part of ordinary strong Hydrochloric Acid and four parts of water) through the funnel tube, gas will be evolved, and can be collected in several jars. Show the property of the gas by introducing a lighted candle, and also by shaking with lime water.

Experiment 17.—The water in the large dish can be tested before and after Experiment 16 with litmus paper, or may be coloured with litmus solution itself.

Experiment 18.—A glass beaker is attached to a balance and carefully counterpoised, and the CO_2 obtained in Experiment 16 can be poured direct into the beaker from the jar (Fig. 3b).

Experiment 19.—Fill a small dish with turpentine and light, and extinguish by pouring a jar full of CO_2 on to the flame (Fig. 3c).

Experiment 20.—CO_2 gas generated in apparatus 3A is passed through a test-tube containing lime water. The precipitate at first formed will soon dissolve. Now heat liquid in tube to boiling, when $CaCl_3$ is again precipitated.

Experiment 21.—Any green leaves may be used—leaves of mint are very good, but aquatic plants give the best results. Make the experiment in triplicate by using, first, boiled water, and for second and third tests water through which CO_2 has been blown, keeping one test in the dark and the other exposed to sunlight. Open the cork of funnel carefully; bring a glowing match near to it, which will burst into flame; or collect gas in a test-tube filled with water, and test gas.

Experiment 22.—Heat dry piece of wood on a small piece of galvanised iron.

Experiments 23 and 24.—Heat wood in test-tube; repeat experiment with pieces of bone, sugar, meat, &c.

Questions to Third Lesson.

1. Which are the allotropic modifications of Carbon?
2. What are the differences in the properties of Graphite and Charcoal?
3. Which the oxygen compounds of Carbon and their chemical formula?
4. How is the supply of Carbonic Acid in the air maintained?
5. How is it that in a cellar containing Carbonic Acid Gas a dog may suffocate, but still a human being may be able to live?
6. Describe the chemical reactions taking place when passing CO_2 gas through lime water.
7. How are Lime Magnesia and Iron Salts present in the soil as insoluble carbonates made available to plant life?
8. Describe the process of Carbon Fixation or Assimilation and the necessary favourable conditions.
9. Why will sugar-cane grown in a dull rainy season contain less sugar in its juice than usual?
10. What are the products of destructive distillation of wood and coal?
11. Why should green crops left on a field be ploughed under and not burnt?
12. Explain the differences between Respiration, Transpiration, and Assimilation of plant life.

Fourth Lesson.

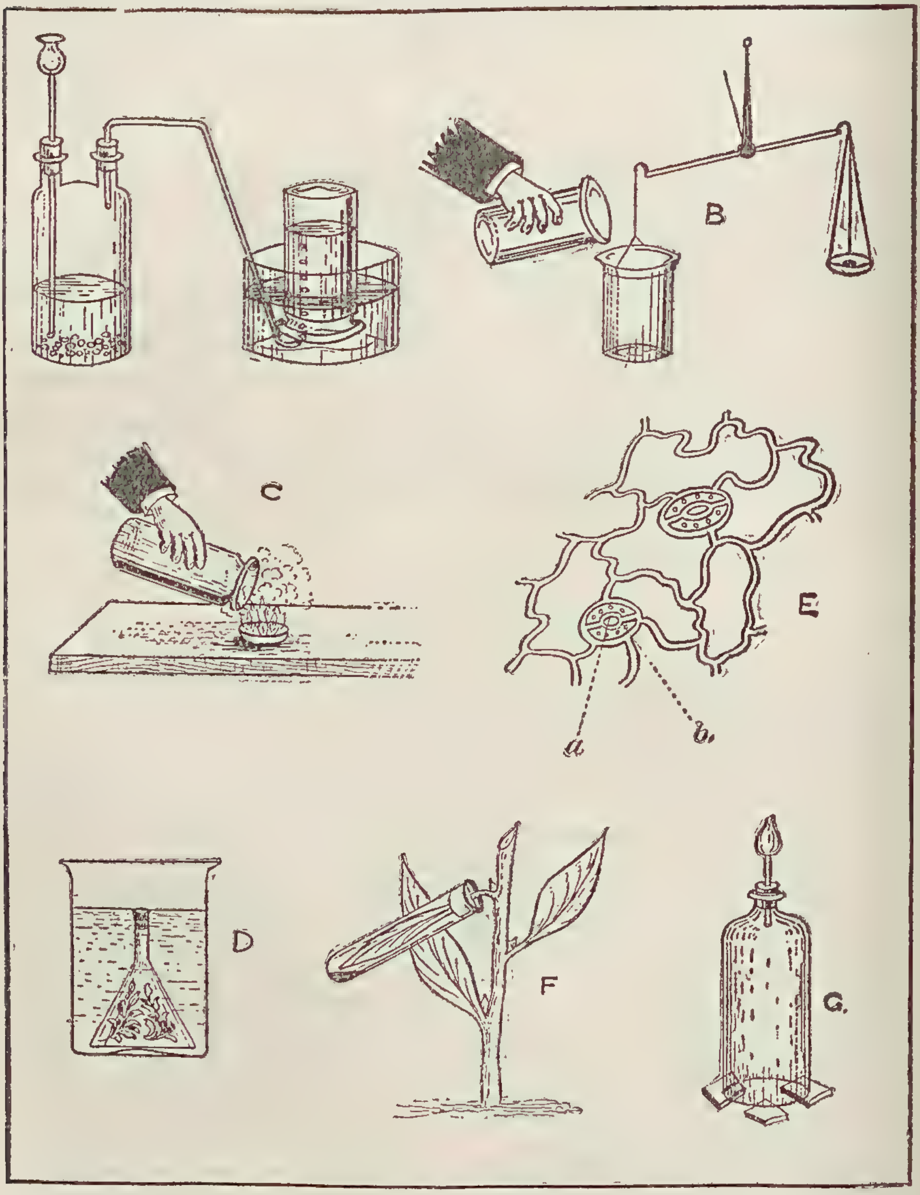
Water and Hydrogen.

Water.—Nearly three-quarters of the surface of the earth are covered with water, which amounts to about 7 per cent. of the weight of the crust of the earth. Water is always found in the air, in soil, and in many minerals. The animal bodies contain from 40 to 65 per cent. of water, and plants even up to 90 per cent. of their weight. When organic substances are burnt, or even if allowed to decompose slowly, water is always formed and given off. Living plants continually take up water from the soil, and exhale it again in form of water vapours through their leaves. If this transpiration goes at a greater rate than the absorption of water by the roots, the plants will show a wilted appearance. Enclosing the green leaf of a growing sunflower in a wide glass tube, with the help of a cork split in two or with a plug of cotton-wool, we will soon notice, if the day is bright and warm, that water will collect in the tube (*Experiment 25*, Fig. 3F). The amount of water given off by plants is very considerable, and by actual experiment it was found that a sunflower $3\frac{1}{2}$ feet high lost 20 oz. of water in twelve hours, and a cabbage about 15 oz. Water is absolutely necessary to living plants, not only as a plant food, but chiefly as a vehicle to carry the various organic and inorganic compounds from one part of the plant to another.

Water is a compound of the two elements *hydrogen and oxygen*, two volumes of hydrogen combining with one volume of oxygen to form two volumes of water vapour.

This combination can be proved by actual experiment by filling a strong glass tube with two parts of hydrogen and one part of oxygen and exploding the mixture with the aid of an electric spark, when, after the explosion, the vapours will only occupy two volumes, or the same volume as the original hydrogen gas. Such a process of building up a new substance from its elements is called **Synthesis.** Just as an electric spark can cause the combination of hydrogen and oxygen, by passing a strong electric current through water,

slightly acidulated to make it a better conductor of electricity, we succeed in splitting the water up again into its elements. This process is called **Electrolysis**, and we obtain two volumes of hydrogen and one volume of oxygen. Pure hydrogen gas, as prepared in a later *Experiment 32*, burns in air with an exceedingly hot but almost colourless flame, forming water vapours, which may be condensed in a cold glass cylinder *(Experiment 26)*.



A mixture of hydrogen gas and oxygen gas explodes when lighted with great violence, but this explosion may be shown with absolute safety (*Experiment 27*, Fig. 3G) by filling a stoppered glass jar or glass bottle, the bottom of which has been cracked off, placed on three small pieces of wood or cork, with hydrogen gas from below. When the jar is supposed to be filled, after passing the gas into it for a few minutes, the generating apparatus is removed, and the small cork at the top of the jar withdrawn from the short piece of glass tubing, and the escaping gas lighted with a match. The gas

Page 214.—Fig. 3 E: Surface of epidermis of bean-leaf, magnified 250 times—

a, Opening of Stomata.

b, Guard Cells of Stomata.

burns quickly until a certain amount of air has entered to produce the explosive mixture, when the gas will explode with a loud report.

Water, in a pure state, is an odourless and tasteless liquid, appearing colourless in small quantities. According to the surrounding temperature, water can exist in three physical conditions—in the form of **water vapour** as a gas, as **liquid water**, and as a solid in the form of **ice, snow**, and **hail**.

Water is a very bad conductor of heat, and it may be easily shown that water can be boiled at the top of a test tube, and still the water at the bottom of the tube remains quite cool *(Experiment 28)*.

Ice is lighter than water, and consequently floats on water. In this respect water is an exception to most other substances, which as a rule are heavier and denser in their solid forms. When water is cooled, it reaches its highest density at a temperature of 4 degrees Celsius or Centigrade, equalling 39 degrees Fahr.; further cooling will decrease the density, and the water will get lighter again. This peculiar property plays an important part in the household of Nature, and prevents a complete freezing of deep lakes and oceans.

One of the most important properties of water is its great **solvent action**, or the power to dissolve gases, liquids, and solids. As a consequence of this property, the water found in Nature is never pure.

Rain water is the purest of natural waters, containing only some gases in solution. One gallon of rain water contains dissolved about 4 cubic inches of nitrogen, 2 cubic inches of oxygen, and 1 cubic inch of carbonic acid gas. It will be noticed that the proportion of the gases held in solution is quite different from the proportion in which they are found in the atmosphere, which is due to their different solubility. Both oxygen and carbon dioxide are found in relatively large quantities, which is of utmost importance to the life of aquatic animals and vegetation.

As soon as the rain reaches the earth and passes through the soil small amounts of mineral matters will be dissolved, which are then found in **spring, drainage**, and **river water**. These waters will differ in their composition in accordance with the nature of the country through which the water has passed in its course.

Sea-water contains a large amount of salts in solution, amounting to about 3½ per cent. of weight. One gallon of sea water contains 2,500 grains total saline substances, of which 1,890 grains are common salt or sodium chloride, $NaCl$. Other salts present in sea water are magnesium salts, as sulphate of magnesia (salts or Epsom salts), $MgSO_4$, and magnesium chloride, $MgCl_2$, which give the sea water the peculiar bitter taste, and also is the cause that clothes, once properly wetted with sea water and not washed with fresh water afterwards, will never become properly dry, but will always be damp in wet weather. Magnesium chloride is a *hygroscopic substance*, which means that it readily absorbs moisture from the air. Sea water contains a great number of other chemical substances in solution, although in smaller quantities.

Almost chemically pure water may be obtained from natural water by **distillation**, a process by which the water is converted into steam in one vessel, which is connected with another vessel, generally in the form of a worm, surrounded by cooling water, where the vapours are condensed, whereas the impurities and saline substances are left behind in the first vessel. A mixture of different liquids when distilled will always yield at first that liquid which has the lowest boiling point. In the distillation of spirits from fermented liquids the alcohol is produced first.

Distilled water, on account of its purity, has an insipid taste, but may be made more palatable by pouring the water several times from one vessel into another, so that a certain amount of gases are absorbed from the air.

Drinking water should be as pure as possible, and, as a rule, should not contain more than about 35 grains of total solids per gallon. It is, however, of particular importance that certain nitrogenous substances be absent, the presence of which would indicate that the water was contaminated by sewage. Water from shallow wells and also surface waters are, as a rule, to be used with suspicion.

Household and general use divides water into two classes—**soft** and **hard water**—from the manner in which the water acts on soap. When soap is used with soft water (rain water, for instance), it produces at once a froth or lather, and helps to clean everything much more readily; when hard water (sea water, for instance) is used, the soap does not lather, but produces white, curdy flakes, and much more soap has to be used before any lather is produced *(Experiment 29)*.

Hard waters are generally softened by boiling. When examining a kettle in which hard water has been boiled for some time, we will find the interior coated with a coat or fur of **incrustation,** which is chiefly composed of minute crystals of calcium carbonate, mixed with other mineral matters. We have already learned that calcium carbonate is dissolved with the aid of carbonic acid, which, when boiled off, causes precipitation of the calcium carbonate. Part of the gypsum or calcium sulphate, $CaSO_4$, is also precipitated by boiling, as this substance is less soluble in boiling water than in water at ordinary temperature. Vegetable matters are also deposited at the same time, and all the precipitated matter forms a hard, compact mass, frequently in many distinct layers **(boiler scale).** This scale is a very bad conductor of heat, and not only retards the boiling, but may in steam boilers lead to the burning of the boiler plates. Numerous substances have been used and recommended for the prevention of boiler scale; some have a purely mechanical action, others are based on chemical principles. The value itself depends largely on the nature of the water. The addition of clay, sawdust, potato skins has often proved beneficial. The addition of caustic soda, washing soda, tannic acid (gum leaves and bark) has often been of service. They all aim at the formation of a loose, muddy sediment, which can be blown off now and then, instead of a scale.

The action of many petrifying springs, as well as the formation of stalactites and stalagmites in limestone caves, is due to the depositing of lime carbonate by the loss of carbonic acid gas. Hardness which is removed by boiling is called **temporary hardness,** to distinguish it from the **permanent hardness,** due to substances which still remain in solution after boiling, like soluble salts of lime and magnesia. Addition of soda to many hard waters will remove both temporary and permanent hardness by formation of insoluble lime and magnesium carbonates.

$MgSO_4$	$+ Na_2CO_3$ (boiled)	$= MgCO_3$	$+ Na_2SO_4$
Magnesium sulphate (soluble).	Sodium carbonate.	Magnesium carbonate (insoluble).	Sodium sulphate (soluble).

Clark's process of softening water is based on the addition of a small amount of milk of lime to the water, just sufficient to neutralise the free carbonic acid gas. This process is improved by subsequent filtration.

The solvent action of water on other substances, as a rule, varies with the temperature, and most salts dissolve in much larger quantities in hot than in cold water. The solubility of common salt, however, is very nearly the same in hot and cold water.

If we shake up in a flask containing cold water some crystals of saltpetre (potassium nitrate, KNO_3), we reach a point when some crytals remain undissolved and the liquid contains as much of the salt in solution as it can carry at that temperature. This is a *cold saturated solution.* We find that 1,000 parts of water will dissolve when cold 300 parts of saltpetre. If we expose such a solution to the air, the water will slowly evaporate, and crystals of saltpetre will be deposited, which are of exactly the same composition as originally dissolved. The crystals contain no water, and are called *anhydrous.* When we heat the water in the flask *(Experiment 30)*, we see that more saltpetre is being dissolved; of boiling water, 1,000 parts will dissolve 2,000 parts of saltpetre, and such a solution would be a *hot saturated solution.*

Some salts, when crystallising, retain some of the water in their composition, and such water is called **water of crystallisation,** and is driven off when the crystals are heated. The blue crystals of *copper sulphate* or *blue vitriol*

contain five molecules of crystallisation water, the formula being $CuSO_4.5H_2O$. These crystals heated, the blue colour disappears, and are changed into a white powder under loss of water *(Experiment 31).* Moistened with water, the white powder will again resume a blue colour. Some salts containing water of crystallisation lose some of this water already at ordinary temperature when exposed to the air. *Washing soda* or *carbonate of soda* has ten molecules of water in its composition ($Na_2CO_3.\ 10H_2O$); exposed to the air, the crystals will be changed into a white powder; they "effloresce" under loss of water.

Hydrogen.—This element is only found in small traces in a free state in the air and in the gases escaping from volcanoes and petroleum wells. In combination with other elements, hydrogen is found in all organic substances and in many mineral substances.

Hydrogen is easily prepared by the action of dilute sulphuric or hydrochloric acid on metallic zinc, in an apparatus similar to that one used for making carbonic acid gas (Fig. 3A, *Experiment 32)*—

$$Zn + H_2SO_4 = \underset{\text{Zinc sulphate.}}{ZnSO_4} + H_2.$$

$$Zn + 2HCl = \underset{\text{Zinc chloride.}}{ZnCl_2} + H_2.$$

The latter process is made use of by plumbers when killing the spirit of salts with zinc for soldering purposes.

Hydrogen is the lightest of all known substances, and has neither taste, smell, nor colour. The gas burns in air with a colourless flame under formation of water *(Experiment 26)*—

$$2H_2 + O_2 = 2H_2O.$$

Hydrogen may also be prepared by letting water act on a small piece of potassium metal; the metal melts, and burns with bright flame floating on the water *(Experiment 33)*—

$$\underset{\text{Potassium.}}{K_2} + H_2O = \underset{\text{Potassium hydroxide.}}{2KOH} + H_2.$$

At the completion of the reaction the water, due to the dissolved potassium hydroxide, will have a decided alkaline taste and reaction, and will colour red litmus paper blue.

In the first method of preparation of hydrogen we see that one atom of zinc liberates two atoms of hydrogen; and in the latter method it takes two atoms of potassium to produce the same quantity (two atoms) of hydrogen gas. The combining capacity of an element is called its **valency.** Zinc being able to replace two atoms of hydrogen, which element is taken as the basis, is called a *divalent element.* Potassium and sodium, which replace only one atom of hydrogen, are *monovalent elements.* Oxygen, which combines with two atoms of hydrogen to produce water, is also a divalent element. Carbon, which combines with two atoms of oxygen in carbon dioxide, CO_2, and with four atoms of hydrogen in methane, CH_4, is a *tetravalent element.* This valency of the elements is often expressed by lines in the chemical formula, and is also called *chemical affinity.* We show thus oxygen with two lines of affinity —O—, which, when saturated with hydrogen, form water H—O—H $= H_2O$. Carbon is shown with four lines—

$$\begin{array}{c} | \\ -C- \\ | \end{array} \text{ or } =C=$$

forming carbon dioxide, $O=C=O = CO_2$,

or methane

$$\begin{array}{c} H \\ | \\ H-C-H \\ | \\ H \end{array} = CH_4.$$

It happens sometimes in chemical compounds that not all affinities are saturated or combined; in carbon monoxide, $=C=O$, we have two lines unsatis-

fied. Such a compound is called an *unsaturated compound.* Under certain conditions and circumstances the valency of elements may change in different compounds.

APPENDIX TO FOURTH LESSON.

SYNTHESIS, the building up of a substance from its constituents in opposition to ELECTROLYSIS, in which a simple compound is decomposed into its elements. By ANALYSIS again the chemist determines the composition of a substance by various tests.

SYNTHESIS OF WATER.—The stout glass tube used for this purpose is called an EUDIOMETER-TUBE and was already used in 1770 by *Cavendish* to prove the composition of water.

This combination by volume, which at first seems impossible—that two volumes of hydrogen *plus* one volume of oxygen form only two volumes of water vapour—is explained by the fact that the molecules of hydrogen and those of oxygen have two atoms each, and lose their individuality by forming new molecules of water which contain three atoms each.

2 volumes H		+	1 volume O	=	2 volumes H_2O	
x molec. H_2	x molec. H_2	+	x molec. O_2	=	x molec. H_2O	x molec. H_2O

Each volume of a gas contains the same number of molecules, although the number of atoms in each molecule may be different.

Experiment 25.—Test-tube fixed as described over leaf of sunflower or other broad-leaved plant. Narrow-leaved plants of hot climates transpire much less water.

Experiment 26.—Hold a dry glass cylinder or tumbler over a hydrogen flame; be particularly *careful not to light a hydrogen flame* until all the air has been driven out of the apparatus.

Experiment 27.—Let the hydrogen gas enter the glass cylinder from below. The top of the cylinder or bottle is closed with a cork, through which passes a short piece of glass tubing of large diameter, and closed with another small cork. As soon as the cylinder is supposed to be filled with the gas, take hydrogen-making apparatus away, and light with a taper after withdrawing small cork on top.

Experiment 28.—Fill a long test-tube with water, and apply heat at the upper end, and hold the tube at the lower end between your fingers.

Experiment 29.—Have two small bottles, one containing rain or distilled water and the other sea water or any hard well water; add a few drops of a soap solution, made by dissolving soap in dilute spirits of wine, or a few shavings of soap, and shake for a while.

Experiment 30.—Saltpetre is mixed with water in a flask, and afterwards heated as explained. To obtain good crystals dissolve about 56 parts of saltpetre in 100 parts warm water, and allow to crystallise slowly.

Experiment 31.—Heat copper sulphate in a test-tube.

Experiment 32.—Prepare hydrogen gas in the same apparatus as described for CO_2 (Fig. 3A), using zinc and dilute hydrochloric acid.

The lightness of the gas may be shown in an arrangement like Fig. 3B, in which, however, the beaker must be fixed with the opening downward, and the hydrogen is allowed to enter upwards from the cylinder in which it was collected. Soap bubbles may also be blown with hydrogen gas, which will ascend with great rapidity, and explode when brought near a burning match.

Experiment 33.—A small piece of potassium metal is thrown on water contained in a small dish.

Questions to Fourth Lesson.

1. What elements must combine and in what proportions to produce water?
2. Which is one of the most important properties of water with regard to its action on other substances?
3. What is the difference between hard and soft water?
4. Why is it wasteful to use hard water for washing clothes?
5. How can hard water be softened?
6. Give some remedies for prevention of boiler scale.
7. At what temperature has water its greatest density?
8. What gases are dissolved in rain water?
9. What is the composition of washing soda, and what happens when crystals are left exposed to the air?
10. By what process can you make drinking water out of sea water?
11. How is Hydrogen prepared?
12. Why is Hydrogen Gas used to fill balloons?
13. What are the properties of Hydrogen Gas?
14. Explain the difference between Monovalent and Divalent Elements.
15. What are the principal salts found in sea water?
16. For what reason can Carbon Monoxide combine with more Oxygen to form CO_2?
17. For what purpose must plants get water?

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1904.					1905.							
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
North.													
Bowen	Nil	Nil	1·66	0·16	4·33	22·69	0·50	1·17	5·72	0·74	0·53	0·39	0·06
Cairns	0·62	0·12	0·37	0·42	7·88	25·74	8·59	6·81	6·92	3·89	1·94	0·43	*
Geraldton	3·99	0·76	2·49	1·18	7·35	28·37	5·71	8·26	20·51	13·35	9 39	2·41	3·88
Herberton	0·59	0·41	0·62	1·15	2·06	7·39	3·37	0·75	2·41	2·67	1·17	0·05	0·89
Hughenden	Nil	0·22	4·10	1·76	0·28	3·37	0·07	0·70	3·84	Nil	0·41	0·47	Nil
Kamerunga	1·05	0·27	1·00	0·43	11·62	29·08	7·56	4·38	8·89	5·63	2·59	1·11	2·16
Longreach	Nil	Nil	4·66	0·72	1·34	1·17	0·53	0·17	2·41	Nil	Nil	0·22	Nil
Lucinda	Nil	2·00	1·90	0·50	2·10	15·40	1·68	2·79	23·06	3·15	1·92	4·14	0·89
Mackay	0·04	8·14	8·07	Nil	1·52	29·89	4 73	3·67	13·19	2·17	1·82	0·95	0·66
Rockhampton	Nil	0·22	1·36	1·32	1·60	15·39	0·92	0·09	8·93	0·95	0·54	0·26	0·51
Townsville	Nil	0·04	3·67	1·17	5·70	13·71	1·97	2·02	6·41	0·52	0·35	0·68	0·06
South.													
Barcaldine	Nil	0·20	3·88	1·02	6·54	1·85	0·12	0·25	1·56	Nil	Nil	0·30	0·04
Beenleigh	0·25	2·11	1·89	4·43	4·55	5·44	3·04	2·91	3·63	2·21	0·40	0·27	1·12
Biggenden	0·29	Nil	4·06	1·08	5·89	13·05	1·94	3·61	3·81	1·46	0·60	0·28	0·10
Blackall	0·14	Nil	4·99	0·53	5·04	3·19	0·23	2·34	5·02	0·21	Nil	0·68	0·04
Brisbane	0·53	1·59	1·28	2·36	3·65	9·09	2·64	2·65	4·50	1·10	0·39	0·28	0·65
Bundaberg	0·62	0·48	3·32	0·16	5·16	16·67	2·17	3·35	6·31	4·26	1·10	0·71	0·17
Caboolture	0·30	1·53	2·42	3·07	7·36	8·10	3·43	3·57	4·89	1·65	0·26	0·05	0·36
Charleville	0·15	0·40	3·14	0·09	2·51	1·70	0·73	1·67	3·87	0·63	0·01	0·15	0·14
Dalby	0·24	3·01	1·07	2·59	2·15	3·40	0·74	5·46	3·09	2·19	0·25	1·15	0·76
Emerald	0·09	0·06	1·44	2·43	2·44	7·77	0·25	1·76	6·00	0·72	0·06	0·50	0·30
Esk	0·33	3·10	2·90	2·90	3·07	8·26	0·85	1·87	3·52	1·68	0·33	0·52	0·57
Gatton College ...	0·07	1·09	1·95	1·14	2·42	5·57	1·10	1·71	4·22	2·56	0·26	0·98	0·27
Gayndah	0·41	0·27	2·49	0·67	2·36	11·34	0·82	1·58	4·06	1·07	0·42	0·54	0·25
Gindie	0·21	0·02	3·09	1·55	2·02	7·07	0·06	1·74	7·44	0·41	0·11	0·37	0·09
Goondiwindi	0·67	1·64	1·09	1·61	1·62	3·37	0·87	2·53	6·49	1·23	0·55	0·72	0·58
Gympie	0·47	0·84	4·08	2·55	3·94	9·75	2·29	2·00	7·05	4·49	0·79	0·78	0·70
Ipswich	0·05	1·56	3·20	1·62	4·25	6·87	1·30	1·85	2·86	1·98	0·50	0·41	0·78
Laidley	Nil	1·87	1·87	3·99	5·26	9·93	2·33	2·17	4·11	2·59	0·56	0·56	0·61
Maryborough	0·46	0·62	3·52	2·62	2·33	20·69	2·67	2·78	3·48	3·56	1·21	0·07	0·26
Nambour	0·59	0·43	1·62	2·08	7·54	13·50	5·38	3·58	6·65	4·79	1·36	0·05	0·83
Nerang	1·22	2·21	3·52	2·39	3·85	4·95	4·99	5·61	8·98	3·63	0·61	0·27	1·55
Roma	0·70	1·22	1·43	0·03	1·76	2·65	1·74	1·44	2·92	1·72	0·21	0·35	0·31
Stanthorpe	0·34	1·85	3·98	1·92	5·00	3·04	0·37	5·29	2·64	1·63	1·01	0·63	1·77
Tambo	0·22	Nil	3·31	0·80	3·90	3·54	1·34	2·51	5·12	0·12	0·06	0·36	0·46
Taroom	0·82	0·05	2·42	1·73	2·92	3·25	1·63	2·73	6·17	2·22	0·33	0·67	0·31
Tewantin	2·20	0·50	1·09	1·93	7·61	11·79	2·91	3·64	12·43	10·01	2·06	0·22	0·55
Texas	0·48	0·81	1·63	0·76	2·97	3·77	0·09	2·47	3·78	3·07	0·80	0·53	1·09
Toowoomba	0·02	2·24	1·61	2·26	2·75	4·50	1·91	4·17	5·27	3·69	0·65	1·01	0·66
Warwick	0·19	2·76	2·89	1·92	3·65	1·52	1·28	6·20	2·06	2·18	0·77	0·26	1·01
Westbrook	0·14	2·29	4·85	3·37	3·65	2·46	0·57	2·00	1·24	2·54	0·46	0·71	0·61

* Return not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian: Victorian, 112s. to 116s.; New South Wales, 112s. to 116s.; Queensland, 102s. to 104s. Danish, 116s. to 122s. per cwt.

CHEESE.—Canadian, 52s. to 54s.; New Zealand, 50s. to 56s. per cwt.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £19 to £21; raw, £16 to £19 15s. per ton; German beet, 88 per cent., 8s. 9d. per cwt.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—8s. to 12s. 6d. per cwt.

RICE.—Rangoon, £8 to £12; Japan, rice crop failed; Java, £17 to £20; Patna, £16 to £17 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 46s. to 125s.; peaberry, 62s. to 120s.; Santos, 34s. to 50s.; Mocha, 56s. to 90s.; Jamaica, 38s. to 39s. per cwt.

CHICORY ROOT, dried (duty paid).—26s. to 27s. per cwt.

ARROWROOT.—St. Vincent, 1¾d. to 3½d.; Natal, 3d. to 5d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

WHEAT.—Duluth, 35s. to 37s. per 496 lb.; English, 35s. to 37s. per 504 lb.; Australian, 32s. 9d. to 33s. per 480 lb.

FLOUR.—Australian, 23s. 6d. per 280 lb.

MALTING BARLEY.—31s. to 33s. per 448 lb.; grinding, 27s. to 28s. per 416 lb.

OATS.—New Zealand, 21s. to 23s.; Australian, 16s. to 19s. per 384 lb.

SPLIT PEAS.—39s. 6d. to 42s. per 504 lb.

GINGER.—Jamaica, 65s. to 74s.; Cochin, 50s. to 80s.; Japan, 15s. to 16s. per cwt.

VANILLA.—7½ to 8½ in., 6s. to 11s.; 7 to 7½ in, 4s. to 8s. 6d.; 3 to 6 in., 3s. to 5s.; splits, 3s. to 5s. per lb.

PEPPER.—Capsicums, 14s. to 60s.; chillies, 45s. to 50s. per cwt.; black, 5¾d.; white, 8⅛d. per lb.

RUBBER.—3s. 10d. to 5s. 4d.; Ceylon "biscuits," 6s. 4d. per lb.

GREEN FRUIT.—Australian: Apples, 14s. to 15s. per case; bananas, 7s. 6d. to 11s. per bunch; pineapples, 2s. 6d. to 5s. each. Oranges, Valencia, per 420, common, 6s. to 7s.; medium, 7s. to 8s. 6d.; fine selected, 14s. to 15s.; finest selected, 14s. to 16s. Lemons, Naples, per 360, ordinary to fine, 30s. to 36s.; finest selected, 30s. to 41s.; grapes, 8s. 6d to 12s. per barrel.

DATES.—Tafilat, none; Egyptian, none; Persian, 10s. 6d. to 13s. 6d. per case.

COTTON.—Uplands, 5d. to 6½d.; Sea Island, 15½d. per lb.

COTTON SEED.—£5 6s. 3d. to £5 10s. per ton.

COTTON-SEED OIL.—Crude, £16 15s.; refined, £17 to £19 10s. per ton.

COTTON-SEED OIL CAKE.—£4 5s. to £4 10s. per ton.

COTTON WASTE.—In 5 cwt. bag bales, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

LINSEED.—39s. to 39s. 9d. per qr.

LINSEED OIL.—£19 to £19 2s. 6d. per ton.

LINSEED OIL CAKE.—£7 12s. 6d. to £7 15s. per ton.

OLIVE OIL.—£33 to £50 per tun (252 gallons).

COPRA (cocoanut-kernel).—£16 5s. to £16 10s. per ton; £8 to £9 per ton at the S.S. Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

COCOANUT OIL.—£28 to £31 per ton.

BEESWAX.—Australian, £7 to £7 17s. per cwt.

LUCERNE SEED.—60s. to 70s. per cwt.

CANARY SEED.—80s. to 100s. per quarter of 480 lb. = 10s. to 12s. 6d. per bushel.

HONEY.—17s. to 26s. 6d. per cwt.

MANILLA HEMP.—£30 to £35 per ton.

SISAL HEMP.—£32 to £35 per ton.

NEW ZEALAND HEMP.—£29 per ton.

FLAX.—£48 to £52 per ton.

TAPIOCA (duty, 5d. per cwt.).—2¼d.to 5d. per lb.; pearl, 11s. to 15s. 6d. per cwt.

EGGS.—French, 9s. 6d. to 10s.; Danish, 7s. to 9s. 9d. per 120.

BACON.—Irish, 65s. to 71s.; American, 45s. to 50s.; Canadian, 58s. to 63s. per cwt.

HAMS.—Irish, 80s. to 108s.; American, 52s. to 58s. per cwt.

TALLOW.—Mutton, fine, 30s. 6d.; medium, 27s. 6d.; beef, fine, 27s. 9d.; medium, 26s. per cwt.

Poultry (Smithfield), August.—Large supplies were to hand, and a rather better demand prevailed. Quotations:—Fowls: Yorkshire, 2s. 3d. to 2s. 9d.; Essex, 2s. 3d. to 2s. 9d.; Boston, 2s. to 2s. 6d.; Surrey, 3s. to 3s. 9d.; Sussex, 3s. to 3s. 6d.; Welsh, 2s. to 2s. 6d.; Irish, 1s. 9d. to 2s. 3d.; geese, 4s. 6d. to 5s. 6d. Aylesbury ducks, 2s. to 2s. 3d.; country, 2s. to 2s. 3d. each. Wild rabbits, 6d. to 8d. each; Australian 6s. to 8s. per dozen. Turkeys, no quotation.

Frozen Meat.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	Sept. 16.	Sept. 23.
New Zealand Sheep.		
(Crossbred Wethers and Merino Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
Canterbury, medium (56 lb. to 64 lb.)	4d.	4d.
Canterbury, heavy (64 lb. to 72 lb.)	$3\frac{3}{4}$d.	$3\frac{3}{4}$d.
Dunedin and Southland (56 lb. to 64 lb.)	None offering.	
North Island (56 lb. to 65 lb.), ordinary	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
North Island, best	4d.	4d.
Australian Sheep.		
(Crossbred and Merino Ewes.)		
Heavy (over 50 lb.)	$3\frac{3}{8}$d.	$3\frac{1}{4}$d.
Light (under 50 lb.)	$3\frac{1}{2}$d.	$3\frac{3}{8}$d.
River Plate Sheep.		
(Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{1}{2}$d.	$3\frac{3}{8}$d.
Light (under 50 lb.)	$3\frac{11}{16}$d.	$3\frac{9}{16}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	$5\frac{1}{8}$d.	5d.
Canterbury, heavy (36 lb. to 42 lb.)	$4\frac{5}{8}$d.	$4\frac{1}{2}$d.
Dunedin and Southland (28 lb. to 42 lb.)	$4\frac{5}{8}$d.	$4\frac{5}{8}$d.
North Island (28 lb. to 42 lb.) ...	$4\frac{7}{8}$d.	$4\frac{5}{8}$d.
Australian Lambs.		
30 lb. to 40 lb., first quality ...	None offering.	
30 lb. to 40 lb., second quality ...	None offering.	
River Plate Lambs.		
30 lb. to 40 lb.	None offering.	
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{7}{16}$d.	$2\frac{7}{16}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{3}{8}$d.	$3\frac{3}{8}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (160 lb. to 220 lb.) ...	None offering.	
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{3}{8}$d.	$2\frac{5}{16}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$3\frac{1}{8}$d.	$3\frac{1}{8}$d.

Queensland Timber.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the English market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand. Ivory wood should be carefully preserved from destruction.

General Notes.

QUEENSLAND AGRICULTURAL COLLEGE OLD BOYS' UNION.

Annual Dinner.

The first annual dinner of the union of ex-students of the Queensland Agricultural College was held at the Café Eschenagen on 11th August. Mr. John Mahon, Principal of the College, presided; and the Hon. Digby F. Denham, M.L.A., Secretary for Agriculture and patron of the union, supported the chair. Amongst other well-wishers present were:—Messrs. E. G. E. Scriven, V.P., Under Secretary, Department of Agriculture and Stock; J. P. Orr, Chief Clerk and Deputy Inspector of Stock; P. McLean; H. Quodling, Inspector of Agriculture; G. B. Brookes, College Farm overseer; H. Hindes, Poultry Expert, Gatton College; A. Martin, manager, Hermitage State Farm; C. Ross, manager, Westbrook State Farm; E. Thynne, who apologised for the absence of the founder of the College, the Hon. A. J. Thynne.

The dinner concluded, a lengthy toast list was got through.

"The King, God bless him," was, of course, proposed and received with acclamation, as was also the toast of the popular president and chairman, "Mr. John Mahon."

Mr. Corser proposed the toast of "The Parliament of Queensland," and coupled it with the name of the Hon. the Secretary for Agriculture, Mr. Digby F. Denham. Mr. Webb seconded the toast, which was enthusiastically drunk with musical honours.

Mr. Denham, in acknowledging the compliment and responding to the toast of "The Government of Queensland," briefly referred to politics. They had had about three weeks of politics already, he said, debating the Address in Reply. It might have been full of interest if there had been any business in it, but it was simply talk, talk. Politics had no striking attraction for him, but they could not afford to lay aside the problems which presented themselves for solution. The difficulty in Australia had been that the people had taken too little interest in politics, but he was glad to know that their young men were now looking on this matter with a good deal of interest. There were some people who, perhaps, made too much of politics, and some too little—they needed to strike a happy medium. Leaving politics, he congratulated them on the splendid display made at the Exhibition, which showed that they were now reaping the fruit of seed sown in the past. He was glad to see so many of the young men taking up the study of agriculture, but warned them against the tendency to become insular. He wished the association prosperity and success. (Applause.) Later in the evening Mr. Denham paid a high tribute to Professor Shelton, the first principal of the College.

Mr. P. McLean proposed the toast of "The Agricultural Department" in a speech complimentary to the Minister and the Department.

Mr. Stupart, in proposing "The Department of Agriculture and Stock," alluded to the comparatively short time during which such a department had existed, and showed how it compared with the departments of other States.

Mr. Scriven responded on behalf of the Agricultural Branch of the Department, and expressed how pleased he always was to be present at the gatherings of the old boys.

Mr. Orr, of the Stock Branch, endorsed all that had been said by Mr. Scriven, and intimated that he also was prepared to do all in his power towards furthering the ends of the union.

Mr. Webb, in proposing the toast of their *alma mater*—"The College"—alluded to the benefit which would accrue from the publication of a journal in helping to keep the past and present students more in touch with each other,

and advocated that a section of the *Agricultural Journal* be asked for in which a start might be made to that end. Mr. Scriven (who had the Minister beside him) rose and stated that the space mentioned would be available in the *Journal*. Mr. Scriven's statement was received with great applause.

Mr. Mahon, in responding to the toast of "The College," stated that, if more money were available, much more could be done at the institution. They wanted two good horses at the College among other things.* He compared the small amount voted by Parliament to support the College compared with that voted by New South Wales towards the maintenance of Hawkesbury College, and showed by figures that the sum returned to the Government by the Queensland Agricultural College was equal to that returned by the Hawkesbury Agricultural College to the New South Wales Government.

Mr. Martin expressed pleasure at being present among new friends, and proposed the toast of "The Queensland Agricultural College Old Boys' Union."

This toast was responded to by many of the members, including Messrs. Walker, Rochet, Jones, Evans, Webb, Corser, Stupart, and Price, who felt pleased to see among their visitors that evening so many of the officials of the department and so many friends of the union.

Kindred associations being honoured, Mr. Quodling, as an old Hawkesbury student, responded in fitting terms, and expressed the great pleasure it gave him, and always had given him, to be present among those connected with the Queensland College.

Other toasts were duly honoured and responded to, including the Minister, Mr. Mahon, the visitors, and the hon. secretary.

A vote of thanks to the president concluded a most successful inauguration of the first annual dinner of the Q.A.C.O.B. Union.

The Annual Meeting.

The first annual meeting of the members of the Old Boys' Union was held at the Department of Agriculture on Saturday, the 12th August. Mr. H. C. Webb was voted to the chair, there being also present: Messrs. F. Jones, T. McDermott, L. C. Stupart, P. Rochet, H. Baker, J. H. Evans, L. Alcock, and several others, including the secretary. Apologies were received from Messrs. C. Bath, W. Palmer, E. R. Isaacs, J. Proud, A. J. Conachan, M. B. Marley, F. Walker, F. Bowler, M. R. Fox, H. McIlwraith, &c.

The minutes of last meeting were read and confirmed, and outward correspondence adopted. Inward correspondence included letters from the Hawkesbury Agricultural College Old Boys' Union and the Victorian Old Boys' College Club. Although both these unions nominated a representative to the Queensland Union's annual dinner, it unfortunately happened that at the last moment neither found it possible to attend. The thanks of the Union were tendered to the Hawkesbury Agricultural College Old Boys' Union for a copy of their valuable journal.

The financial result of the first year's business showed a satisfactory balance, and it was resolved to have union paper and envelopes printed.

The chairman brought up the question of the election of officers for the coming year, which resulted in the following motion by Mr. Evans being carried:—That the officers of last year retain office, with power to add to the vice-presidents' list, if desired.

Messrs. Quodling, Brookes, J. C. Brünnich, and Major Boyd were then elected as additional vice-presidents.

On the motion of Mr. Stupart, seconded by Mr. Rochet, a committee consisting of thirteen members, including the secretary, was elected.

The next business was the election of a secretary and treasurer for the year, resulting in the re-election of the past secretary.

It was considered advisable to appoint a deputy to represent the union at

* Mr. Mahon went south during last month, and purchased the draft colt Prince, by Federation, bred by Mr. McDonald, for 220 guineas.—Ed. *Q.A.J.*

the Department of Agriculture and Stock; and, considering Mr. J. P. Orr's interest in the union, it was resolved to ask him to fill that position.

The date of the next annual dinner was fixed for Thursday in the week of the next exhibition of the National Agricultural and Industrial Association in Brisbane.

Mr. Jones moved that a subcommittee consisting of Messrs. Stupart, Webb, and Bayley be appointed, with whom the secretary may communicate, and add to, if necessary, when arranging details in connection with the second annual dinner of the union.

The proposal that a medal be cast as a badge of the union was considered, and, after a design had been drawn out, the matter was left in the hands of Mr. Rochet to see the makers of such articles and ascertain the cost. A medal, when made, will be forwarded to the secretary for approval.

It was unanimously resolved that the union's thanks be conveyed to the Under Secretary (Mr. E. G. E. Scriven) for his kindness in meeting the wishes of the Old Boys by offering them space in the *Agricultural Journal* in which to publish their articles and business; also for the very kindly interest that gentleman had always shown them as students, which was very much appreciated by them as members of the union.

It was further decided that the secretary forward an account of the present meeting and the annual gathering to the *Agricultural Journal;* also, that two of the committee-men be responsible for two articles each, to appear in the *Journal*, and that the secretary should give the necessary notice to the editor; that present students of the College be asked, through Mr. Mahon, to contribute to the union's space in the *Journal* of the Department of Agriculture; that the union forward to the Hawkesbury Agricultural College Old Boys' Union, the Victorian Agricultural College Club, and the Roseworthy Agricultural College Old Boys' Association, South Australia, copies of the *Queensland Agricultural Journal;* that the subscription to the union remain the same as at present—viz., 5s. per annum.

The meeting closed with the usual thanks to the chair.

The following is a list of office-bearers:—

Patron: The Hon. Digby F. Denham, Minister for Agriculture. President: John Mahon, Esq., Principal, Queensland Agricultural College. Vice-presidents: E. G. E. Scriven, Esq., Under Secretary, Department of Agriculture and Stock; J. P. Orr, Esq., Chief Clerk, Department of Agriculture and Stock; J. C. Brünnich, Esq., Chemist, Department of Agriculture and Stock; Major A. J. Boyd, Editor of the *Queensland Agricultural Journal*; E. H. Quodling, Esq., Director of Agriculture; P. McLean, Esq., late Agricultural Adviser; C. McGrath, Esq., Dairy Instructor, Queensland Agricultural College; P. M. Pitt, Esq.; E. H. Gurney, Esq.; G. B. Brookes, Esq., Farm Foreman, Queensland Agricultural College. Committee: Messrs. H. C. Webb, H. Palmer, A. J. Conachan, P. Rochet, L. C. Stupart, H. E. Andersen, T. F. Bowler, F. L. Jones, P. M. Bayley, J. H. Dalrymple, C. Bath, J. H. Evans. Hon. secretary and treasurer, B. H. Corser, Esq.

Sugar Experiment Station, Mackay,
18th September, 1905.

To the Members of the Queensland Agricultural College Old Boys' Union.

Gentlemen,—The secretary of the Old Boys' Union has notified me that you have appointed me a member of the committee of the Old Boys' Union for the coming year, which position I have much pleasure in accepting, and shall endeavour to render all assistance possible to the union. He has also notified me that Mr. P. Bayley and myself have been nominated to contribute the first two articles to the Old Boys' Union space in the October number of the *Queensland Agricultural Journal.*

It is with much regret that I have to state that unforeseen circumstances have prevented me from having an article ready for publication in that number of the *Journal*, but shall be pleased to have one ready for the next or any succeeding issue.

With kind regards,

I remain,

Yours faithfully,

ALBERT E. ANDERSSEN.

SISAL HEMP FROM THE CAICOS ISLANDS.

The Imperial Commissioner of Agriculture recently forwarded to Messrs. Ide and Christie, the well-known fibre brokers of Mark lane, London, a sample of sisal fibre from the Caicos Islands with the request to be favoured with an opinion as to the quality and value of this fibre as compared with similar fibre from Yucatan and the Bahamas. The fibre had been sent by the Commissioner of the Turks Islands, who wrote:—"It is from the East Caicos Company's plantation, and is cut from plants only *twenty-two months old.* I think it would be hard to beat the fibre anywhere at the age; it is strong, of good length, and bright in colour."

The report, dated 25th April, 1905, received by the Imperial Commissioner of Agriculture from Messrs. Ide and Christie is as follows:—

"Your favour of 4th instant and sample of Caicos Islands sisal hemp duly to hand. Shipments from time to time have come to London, and sold fairly well. We find the type of good preparation, but the length somewhat shortish, and the colour yellow; we have seen better and worse from these parts, as also the Bahamas. Compared, however, with the Mexican, excepting in the length, we consider the East Caicos Company's production superior, and we value such here to-day £34 per ton.—*Agricultural News*, Barbados.

ORANGE WINE.

An excellent recipe for making orange wine is given by Mr. Pairault, a French colonial chemist, in the U.S. Monthly Consular Reports for October, 1904.

"In the Antilles," he says, "orange wine has been made for some time in the following manner:—The oranges are peeled and pressed by hand. To the juice thus obtained sugar is added, and it is subjected immediately, in a vessel made of glass or earthenware, to spontaneous fermentation, which in general takes place easily because the ferment which determines it is often found in the oranges themselves. This spontaneous fermentation proceeds slowly because the sugared orange juice is not a very nutritious medium for the yeast, and consequently an acetic acid fermentation sets in that yields a detestable product. For this reason it is very rare to meet good orange wine. Many times the flavour differs with the different producers. Doubtless nothing is easier than to secure a satisfactory product and a constant type.

"After the orange juice has been sterilised sufficiently there should be added to every quart of the liquid 12·25 oz. to 14 oz. avoirdupois (350-400 grammes) of sugar, 0·175 oz. avoirdupois (5 c.c.) of brewer's yeast, and 2 oz. of a mixture made of the following proportions:—Ammonium phosphate, 30; calcium phosphate, 40; potassium bitartrate, 40; magnesium sulphate, 3. When the mixture is cooled fermentation proceeds, and in a few days there results an excellent product. A sweet or dry wine may be made by increasing or diminishing the amount of sugar added."

A VETERAN GARDENER.

Mr. G. A. Freestone has for the past fourteen years been carrying on fruit and vegetable gardening at Ashunney, which is on the Burketown-Camooweal road, 30 miles from the latter township. His great trouble is the pest of white ants which attack all fruit trees and vines. He has, however, managed to save 98 per cent. of his vines, by surrounding them with tin sunk 4 inches in the ground. Every now and then, he puts arsenic or Paris green mixed with flour in the tins, and digs it in with a knife, and so has mastered the ants. We would suggest an application of sulphide of carbon, which will infallibly destroy the ants, if a piece of cotton or rag soaked in the chemical is put into the ground infested with them. As this is a powerful explosive, smoking or striking matches should be avoided whilst using it. Another way is to soak pieces of soft pine in some arsenical mixture, and bury them at a little distance from the vines or fruit trees. As the orange-trees are now in good bearing, it is worth while to go to a little trouble to preserve them from destruction. The old gentleman has spent over £800 on his garden, and does not feel like giving it up and starting afresh elsewhere. English potatoes have always proved a failure with him, so he proposes to try yams. These are easy to grow, and in good, deep soil are very prolific. The best planting season is from January to April. They require from nine to eleven months to mature. Planting may, however, be done during every month of the year. An acre will produce about 4 to 5 tons, and catch crops, such as sweet potatoes, may be grown between the rows, as the rows are or should be 18 feet apart. Yams vary in size from the small "cush-cush" or buck yam, 9 inches long and 3 inches thick, to the enormous Guinea yam, weighing often 30 or 40 lb. The White yam and Negro yam run to about 10 lb. in weight. The latter does not keep well, whilst the White yam keeps very well, and is about the best to plant.

Crops for Arid Districts.

The continued dry weather of the past three months has operated so disastrously on the wheat and other field crops throughout the State that it becomes a matter for serious consideration that some crop should be produced which either is able to stand a long drought, or whose nature demands very little rain during the growing season and absolutely dry weather at harvest time. In arid districts where irrigation on a sufficiently extended scale can be adopted, such a necessity need not be considered, because, wherever artesian water of good quality can be obtained, the farmer is independent of cloud water. He is able at the proper time to supply the needful amount of moisture required by the growing crop, and to withhold it when the crop has arrived at maturity, and is thus absolutely certain of reaping the fruits of his labour. In the Central district, in the neighbourhood of Barcaldine, and, in fact, over most of the cretaceous area of the State, where artesian wells abound, wheat, maize, fruit, and other field crops yield rich harvests in the severest droughts, so that the adoption of drought-resisting plants does not apply in such cases. But where no artesian water exists, and in districts where there is not an inexhaustible supply of underground water, as on the Burdekin Delta, or on the Burnett, near Bundaberg, the fickle seasons give the farmer no asurance that his crops will come to maturity. This has, unfortunately, been shown in the instance of the wheat crops. Over the whole wheat area of the Darling Downs scarcely any rain fell after the seed germinated. The constant heavy westerly winds extracted all the surface moisture of the soil, with the result that all vegetation was at a standstill, and thousands of acres under wheat produced nothing but sufficient green fodder to supply the lack of the natural and sown grasses. Maize and potatoes suffered from the same cause, and dairy farmers were hard put to it to keep

up the cream supply, even with lucerne and paspalum, which were practically the only fodder crops available for the dairy stock.

Under these unfortunate weather conditions, the question forces itself upon us: Is there any crop which can be depended upon to withstand these periodical dry spells? There are certainly two which can do so. These are cotton and sisal hemp. If cotton receive a sufficient amount of moisture to enable the seed to germinate and the plant to make a good stand, it will continue to grow, even in the absence of rain, until the flowering time, when it requires a reasonable amount of moisture to ensure the setting of the bolls. After this, the plants will thrive right up to harvesting time, when rain becomes a calamity instead of a blessing, as cotton must be picked only in dry weather. It goes without saying that the cotton plants are all the better for genial showers at intervals during the growing season, but, failing such showers, they will yet yield a good crop. As for the sisal agave, it revels in hot dry weather. Much rain is injurious to the production of fibre. As a proof of the indifference of the plant to drought conditions, it may be mentioned that wherever it is cultivated in the State it made most remarkable growth during the dry months succeeding last July. This was especially noticeable on a field which had been planted out during the very dry time when there was no sensible moisture in the soil. The plants were only about from 6 to 8 inches high, but they grew vigorously, and looked as healthy as if regular showers had fallen.

It is true that the sisal plant takes from three to four years before any crop can be expected, but catch crops can be grown for a time between the rows, and for two seasons a crop of cotton can be taken off the same land. The planter of an orange orchard waits patiently for from three to five years for a first crop, but at the end of that time his patience is richly rewarded. The orange-grower, however, can make a comfortable living from 10 acres of orange-trees in full bearing, whereas a sisal hemp plantation requires to be on a much larger scale to be payable. On the other hand, the latter plant will thrive on land which will produce no other crop, and does not require the attention and cultivation demanded by fruit trees, pineapples, or sugar-cane, maize, and potatoes. It can be planted and harvested irrespective of seasons, and the machinery required for extracting the fibre is, comparatively with that required for sugar or arrowroot manufacture, very inexpensive. Furthermore, the heavy outlay for horses, farm implements, and fertilisers is not required in the case of this fibre plant. The crop is a certain one, and on a fairly large plantation harvesting can go on all the year round, or be delayed for six or twelve months without entailing any loss on the planter.

During the late dry spell, bush fires raged in all directions, and, all the shrubs and grasses being temporarily destroyed, kangaroos, wallabies, bandicoots, &c., invaded the cultivated lands, and inflicted great damage on the budding grape vines and young orchard trees. The sisal hemp plant they left severely alone.

Another point in favour of growing sisal hemp, especially in the Western districts, is the value of the suckers. At two or three years of age the plants send out a number of suckers from the roots. These suckers are sold in Yucatan, Mexico, the home of the sisal agave, at 80 dollars (Mexican) (£8) per 1,000. In order to prevent competition, growers in that country are said to boil them before exporting. A grower in Hawaii recently offered to supply the writer a couple of millions of plants at the following prices f.o.b. Honolulu:—

Pole plants, *i.e.*, bulbils, at £2 per 1,000.
Nursery plants, at £3 per 1,000.
Plants 12 inches to 18 inches high, at £5 per 1,000.

And this exclusive of labour, packing, freight, and a heavy export duty.

Thus we have at least two articles which can be produced in Queensland in the arid areas, and for which there is a world-wide demand. Why hesitate to enter upon their cultivation?

Answers to Correspondents.

TREATMENT FOR FISTULA IN HORSES.

E. D., Tarampa.—

Blistering is often beneficial at the commencement, but in most cases thorough surgical treatment is necessary before recovery takes place.

Why fistulas are so troublesome to treat is because the tubular passages (which lead from the surface opening) are lined by a false membrane. This membrane must be removed before the wound can permanently heal, and the best way to bring this about is to probe the wound, thus finding out the depth and direction of the tube or tubes; then open boldly with the knife (these tubes), and apply the following lotion on some cotton-wool:—

Corrosive sublimate	$\frac{1}{2}$ oz.
Methylated spirit	3 oz.
Water	3 oz.

Apply every third day until the third application. Keep the wound clean, and apply lard or oil to the outside where the discharge runs.

COMMERCIAL BUTTER IN MILK.

Butter-fat, Cairns.—

To estimate the amount of commercial butter that should be obtained from a given quantity of milk when butter-fat test is known:—

Rule.—Deduct ·25 from the test, multiply the remainder by 100, divide the product by 85, multiply the weight of milk by the quotient.

Example.—32$\frac{3}{4}$ lb. of milk, testing 3·4; find commercial butter.

3·4	32 75
·25	3·7
85)315·(3·7	22925
255	9825
·600	1·21175
595	

Commercial Butter ... ... 1·21 *Ans.*

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	SEPTEMBER. Prices.
Apples, Eating, per packer, Victorian (out of season)	6s. to 8s.
Apples, Eating, per packer, Tasmanian	6s. 6d. to 7s. 6d.
Apples, Cooking	6s. 6d. to 7s.
Apples, Local	...
Apples, American, Green	...
Apricots, quarter-case	...
Apricots, American, per 108's	...
Bananas, Sugar, per bunch	3d. to 9d.
Bananas, Cavendish, per bunch	6d. to 1s. 3d.
Bananas, per dozen	2d.
Cape Gooseberries, quart	5d.
Cherries, quarter-case	...
Comquats, case	2s.
Custard Apples, quarter-case	2s. to 3s.
Grapes, per lb.	...
Granadillas, case	1s. 6d. doz.
Gooseberries, English	...
Lemons, American, per case	...
Lemons, Local	3s. to 4s. 6d.
Lemons, Italian, per case	...
Lemons, Italian, per 180	...
Loquats, half-gincase	4s.
Mandarins, Local	5s. to 6s. 6d.
Mandarins, Bowen	5s. to 6s. 6d.
Mangoes, half-case	...
Mangoes, good, half-case	...
Melons, per dozen	...
Nectarines, quarter-case	...
Oranges, Italian, per 180	...
Oranges, American	...
Oranges, Sydney (packers)	...
Oranges, Local	4s. to 5s.
Passion Fruit, quarter-case (N.S.W.)	4s. to 5s.
Papaw Apples, per case	2s. to 3s.
Peanuts, per lb.	2½d.
Pears, Victorian, quarter-case	...
Pears, Tasmanian, quarter-case	3s. 9d. to 4s. 6d.
Persimmons, quarter-case	...
Pineapples (rough leaf), per dozen	1s. 3d to 1s. 6d.
Pineapples (smooth leaf), per dozen	3s. to 4s.
Plums, Black, quarter-case	...
Plums, Light, quarter-case	...
Plums, American, per 108's	...
Quinces, quarter-case	...
Rosellas, per sugar-bag	...
Tomatoes, quarter-case	2s. 6d. to 3s. 3d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR SEPTEMBER.

Article.		SEPTEMBER. Prices.
Bacon (Pineapple)	lb.	$5\frac{1}{2}$d. to 7d.
Barley, Malting	bush.	2s. 6d. to 3s. 3d.
Bran	ton	£4 7s. 6d. to £5 15s.
Butter, Factory	lb.	9d. to $11\frac{1}{2}$d.
Chaff, Mixed	ton	£2 to £4.
Chaff, Oaten	,,	£3 to £4 10s.
Chaff, Lucerne	,,	£3 to £8.
Chaff, Wheaten	,,	£1 10s. to £3.
Cheese	lb.	$6\frac{1}{2}$d. to $7\frac{1}{2}$d.
Flour	ton	£7 15s. to £8 10s.
Hay, Oaten	,,	£4 17s. 6d. to £5 2s. 6d.
Hay, Lucerne	,,	£2 5s. to £7 15s.
Honey	lb.	$1\frac{1}{4}$d. to $1\frac{3}{4}$d.
Maize	bush.	2s. to 3s. 9d.
Oats	,,	2s. to 2s. 6d.
Pollard	ton	£4 10s. to £5 15s.
Potatoes	,,	£5 to £11.
Potatoes, Sweet	,,	£2 to £3 15s.
Pumpkins	,,	£1 10s. to £2 11s. 8d.
Wheat, Milling	bush.	3s. to 3s. 5d.
Wheat, Chick	,,	3s. to 3s. 9d.
Onions	ton	£12 to £24.
Hams	lb.	$8\frac{1}{2}$d. to 10d.
Eggs	doz.	$4\frac{3}{4}$d. to 6d.
Fowls	pair	1s. 6d. to 3s. 6d.
Geese	,,	3s. 9d. to 5s. 6d.
Ducks, English	,,	2s. to 4s. 1d.
Ducks, Muscovy	,,	2s. 6d. to 4s. 9d.
Turkeys, Hens	,,	4s. to 6s.
Turkeys, Gobblers	,,	7s. 6d. to 12s.

ENOGGERA SALES.

Animal.	JULY. Prices.	AUGUST. Prices.
Bullocks	£9 10s. to £11 2s. 6d.	£10 10s. to £12 7s. 6d.
Cows	£7 to £7 12s. 6d.	£7 15s. to £8 15s.
Merino Wethers	22s. 9d.	22s. 3d.
,, Ewes	18s. 6d.	19s. 6d.
C.B. Wethers	23s. 9d.	24s.
,, Ewes	21s.	19s. 9d.
Lambs	16s. 9d.	15s. 6d.
Pigs (market glutted)	...	4s. to 26s. 6d.
,, Baconers	28s.	...
,, Porkers	19s. 6d.	...
,, Slips	2s. 9d. to 5s.	...

EXHIBITION.

Animal.	AUGUST. Prices.
Bullocks, Champion	£19
Cow	£13
Merino Wethers	22s.
„ Ewes	16s.
C.B. Wethers	27s. 6d.
„ Ewes	21s. 9d.
Lambs	14s. 6d.

Farm and Garden Notes for October.

Field.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore our advice of last month holds with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, sorghum, setaria, imphee, prairie grass, panicum, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, earthnuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. See our instructions in this issue of the *Journal* as to the planting of *Agave rigida* of Sisal hemp. The demand for this fibre is constantly increasing, and the supply does not overtake the demand; hence prices keep high. The latest August sales in America brought over £40 per ton. Plant only on *dry* soil. Cotton may still be sown.

Kitchen Garden.—Our notes for this month will not vary much from those for September. Sowings may be made of all kinds of vegetables. We would not, however, advise the sowing of cauliflowers, as the hot season fast approaching will have a bad effect on their flowering. French beans, including butter beans, may be sown in all parts of the State. Lima and Madagascar beans should also be sown. Sow the dwarf Lima beans in rows 3 feet apart, with 18 inches between the plants. The kitchen garden should be deeply dug, and the soil reduced to a fine tilth. Give the plants plenty of room, both in sowing and transplanting; otherwise the crops will be drawn and worthless. Thin out melon and cucumber plants. Give plenty of water and mulch tomato plants planted out last month. Remember to water early in the morning or late in the evening, and next day stir the soil to prevent it caking.

Flower Garden.—Plant chrysanthemums, giving them plenty of water. The garden should now be showing the results of the care bestowed upon it during the last three months. Plant tube roses, crinums, gladiolus, and other bulbs. Plant out palms and all kinds of tropical and semi-tropical plants. If the weather should be hot after planting, water and shade the plants. Roses should now be in full bloom. Sow dianthus and snapdragon, plant out coleus. Do as much work as possible now on dull, showery days. Having finished transplanting, the principal work will consist of raking and stirring the beds, staking, shading, and watering. As rose blooms fade cut off the spent flowers, and keep the bushes free from aphis.

Farm and Garden Notes for November.

Why do so few farmers grow their own vegetables? This is a question that is frequently asked by visitors to the farming districts. The reason probably is that vegetables require a good deal of care and attention, which mean also a good deal of time taken from the ordinary farm work. In many cases it pays the farmer better to buy many kinds of vegetables than to grow them for himself. The only vegetables grown on many fine farms are cabbages and pumpkins, not to class potatoes under that head. Many people have an idea that European vegetables cannot be grown during the hot summer months, but this is a great fallacy. The Chinese gardeners supply the towns with all kinds of vegetables, except, perhaps, cauliflowers, during the whole of the summer. It is, therefore, clear that, by constant work, plenty of manure, water, and some shade for seedlings, most vegetables can be produced during the hot months from November to March.

Field.—Under ordinarily favourable conditions, harvesting the wheat and barley crops may now begin. Those who have oats for hay should cut it when the grain has formed, but before it is ripe, for then the plant is in its most nourishing condition. Destroy caterpillars on tobacco plants, and top the latter so as to throw all the strength into the leaves. Keep down the weeds, which will now try to make headway; earth up any growing crops requiring the operation; sow maize, imphee, setaria, kafir corn, teosinte, sorghum; and plant sweet potatoes, sisal hemp, yams, earthnuts, ginger.

Kitchen Garden.—If your ground has been trenched or deeply dug and well worked, the advantages will be seen during the coming months. It does not pay to work shallow, dry ground. When sowing and planting this month, give plenty of room between the rows and the plants—otherwise they will be drawn up and worthless—and keep the ground open by constant forking and hoeing. Thin out melon and cucumber plants. It is a good plan to peg down the vines. They will then not be blown about by the wind; they will take root at intervals, and thus help the main stalk. Give plenty of water to tomatoes planted out last month. They should also be mulched. Sow cabbage, French beans, melons, lettuce, radish, pumpkins, cucumbers, marrows, rosellas, &c., and transplant for succession in calm, cloudy weather.

Flower Garden.—Stake any dahlias which may now be above ground. Plant out the bulbs which were stored in a moist place. If the weaker bulbs are reserved, they will come in for autumn planting. Take up all bulbs that have done flowering, and store in a dry place. Winter-flowering plants will have gone off almost; still, the garden should be in full bloom, and will well repay the trouble bestowed on it, and a little fertiliser given as a top-dressing will assist the plants to bloom and look well for a longer time than if this were neglected. Give weak liquid manure to chrysanthemums, and allow no suckers to grow till the plants have done flowering. Take up narcissus. Do not store them, but plant them at once in new situations. Sow antirrhinum, balsam, zinnia, summer asters, summer chrysanthemums, calliopsis, and nemophila.

Orchard Notes for October.

By ALBERT H. BENSON.

Keep the land well cultivated, and, if dry, see that it is well stirred, but not turned. Attend to the disbudding of all young trees, for, if superfluous growths are checked now, they are converted into fruit-wood, and the vigour of the tree is thrown into those shoots which are to form the future branches of the tree. Disbud all vines, rubbing out all superfluous shoots, leaving only as many canes as the vine is strong enough to mature fruit to perfection on.

Sulphur all vines to prevent oïdium, as, if there is any muggy weather during the month, this disease is sure to make its appearance. Where Black-spot is present, spray the vines with Bordeaux mixture; and if caterpillars are troublesome as well, then add 1 oz. of Paris green to each 2 gallons of Bordeaux mixture, and both pests will be destroyed by the one spraying. When using Bordeaux mixture there is no necessity to use sulphur for oïdium, as the Bordeaux mixture answers equally as well. Don't spray when the vines are in blossom; but with varieties that are shy setters it is often a good plan to sulphur when in blossom.

The nursery should be carefully attended to; where not already done the ties of all grafts should be cut and the scions should be trained so as to make a single upright stem. Where buds have been put in, they should be started by cutting back the stock sufficiently to cause them to grow, but the stock should not be cut hard back all at once, but by degrees, always leaving a portion of the stock above the bud to tie the young shoot to. Plant pines and bananas during the month, selecting suckers from healthy plants and from plants that are good croppers, and that produce good fruit, as a careful selection of suckers always pays well. Continue the treatment for Maori or Rust Mite of the orange recommended in the Notes for September; and where orange bugs, either the green or bronze, are present, destroy every mature insect that can be found, so as to prevent them breeding, as the killing off of the first crop will materially lessen their number for the season. Hand-picking, though slow, is probably the best remedy, though, before the insects are fully grown, large numbers may be destroyed by driving them on to the main branches of the trees and sweeping them off with a broom on to a cloth, from which they can be gathered and killed. Take every possible precaution against the fruit fly by destroying every infested fruit that you can. If there are maggots in cumquats or any other fruits, destroy every one, as the cleaner the sweep that is made of the first crop of flies the less trouble there will be throughout the season. Where Scale Insects have been introduced on young trees into clean districts, every care should be taken to keep the pest from spreading; and in cases where the young trees are badly affected, it will pay the grower to destroy them at once, as the first loss will be the least. Where leaf-eating insects of any kind are troublesome—such as caterpillars of all kinds, the larvæ of the fig beetles, or the false ladybirds that attack all kinds of cucurbitous plants, potatoes, &c.—they can be readily destroyed by a spraying of Paris green, 1 oz. to 10 gallons of water, with lime added in as large a quantity as can be got through the nozzle of the pump without choking, as this will tend to make the poison stick on better to the leaves, branches, or fruit.

Orchard Notes for November.

By ALBERT H. BENSON.

The earliest varieties of summer fruits will be ready to market during November; and, as this is the beginning of the season, I beg to call the special attention of every fruitgrower in the State to the importance of gathering and destroying all fly-infested fruits now if he wants to save any crop at all, as the neglect to destroy the first crop of flies will result in the loss of the succeeding crops of fruit. It is impossible to over-estimate the importance of destroying the early crops of fruit flies, as if left alone they breed so rapidly that the fruit crop is soon infested and destroyed.

The best way of destroying the first crops of flies is to gather and boil all infected fruit; such fruit, when boiled, to be fed to pigs or other animals. Feeding the fruit without boiling will result in the escape of a number of the maggots, and is therefore undesirable, besides being contrary to the Regulations of the Diseases in Plants Act.

During the month, the Orchard should be kept well cultivated, especially in districts where the rainfall is light; and in such districts, if water is available for irrigation, a good watering should be given to all fruit trees and vines. By a good watering I don't mean damping the surface but giving the soil a thorough soaking, as one good watering is worth a dozen small ones. Attend to the summer pruning of all young trees, removing any superfluous branches and pinching back all strong growths. Attend to the cultivation of the nursery; stake all grafts or buds, so as to produce straight, well-grown trees, the bud or graft being topped at the height that it is wished to form the head of the future tree.

Agriculture.

BROAD *V.* NARROW TIRES.

At the time of the opening of the Queensland Agricultural College, Mr. J. T. Bell, M.L.A. (the present Minister for Lands), examined the carts and wagons of the institution. Remarking on the narrowness of the tires, he said that they would have a very injurious effect upon the roads. It only needs a journey on many of our country roads to verify this statement of Mr. Bell's. All European countries, advanced in road-making, have laws regulating the width of tires used on wagons, carts, and vehicles for heavy draught.

In France the width of tires ranges from 3 to 10 inches, usually from 4 to 6 inches. Every market wagon and tonnage wagon is practically a road roller; the forward axle is about 14 inches shorter than the rear axle, so that the hind wheels run in a line about an inch outside the level rolled by the fore wheel. In Germany all carts for heavy loads must have a width of tire of at least 4 inches. In Austria the law demands from 4⅓ to 4½ inches.

Broad tires thus perform the duty of rollers in keeping a smooth and compact roadway free from ruts. Narrow tires tear up, wide ones consolidate. A wagon with 5-inch tires requires one horse less with a heavy load than one with 3-inch tires. In this connection, the *Florida Agriculturist* reprints the following article from *The Metropolitan and Rural Home*:—

The Missouri Experiment Station has made a series of tests extending from January to September of last year in order to ascertain the value of wide tires as compared with narrow ones. Conclusions follow.

In conducting the experiments two ordinary farm wagons were used, one with 6-inch tires, the other with standard 1½-inch tires, both wagons of the same weight, and each loaded with 2,000 lb. It was found that the power needed to draw the narrow-tired wagon, with its 2,000-lb. load, on a gravel road, would have pulled a load of 2,472 lb. on the wide-tired wagon. The same power required to draw narrow tires over dirt and gravel roads, when these were dry and hard, was found sufficient to draw a 2,530-lb. load on the wide-tired wagon under the same conditions. It was shown that where these roads were deep with mud, but partially dried at the surface with a few hours' sun, the same power required to draw the 2,000-lb. load over them on the narrow tires would pull a load of 3,200 lb. on the wide tires.

The director of the station states that the conditions under which the narrow tires offer an advantage over the wide ones are "unusual and of short duration," and, further, that "through a majority of days in the year, and at times when the dirt roads are most used, and when their use is most imperative, the broad-tired wagon will pull materially lighter than the narrow-tired wagon"; also that "a large number of tests on meadows, pastures, stubble land, corn ground, and ploughed ground in every condition, from dry, hard, and firm to very wet and soft, shows without a single exception a large difference in draught in favour of the broad tires. The difference ranged from 17 to 120 per cent."

As a result of all experiments conducted, he says:—"It appears that 6 inches is the best width of tire for combination farm and road wagon, and that both axles should be the same length, so that the front and hind wheels will run in the same track."

WHEAT-GROWING ON THE MURRAY FLATS, SOUTH AUSTRALIA.

Last August a paper was read at a meeting of the Sutherland branch of the South Australian Bureau of Agriculture by the chairman, Mr. Twartz, on his experiences of twenty-seven years in wheat-growing on the Murray Flats. His

crop for 1888 was a total failure. In the succeeding year he cleared a profit of £400 from 170 acres. Then he showed the results from 200 acres of wheat for the five years from 1900 to 1904 as here summarised:—

	£	s.	d.
1900—To ploughing, 3s. 6d. per acre	35	0	0
Harrowing, 6d. per acre	5	0	0
Scarifying, 1s. 6d. per acre	15	0	0
Sowing, at 3d. per acre	2	10	0
125 bushels seed, at 2s. 7d. per bushel	16	2	11
Harrowing after sowing, 6d. per acre	5	0	0
Cleaning, at 6d. per bag	11	5	0
Cartage to station, 4d. per bag	7	10	0
450 bags, at 6d. each	11	5	0
2 years' rent, at 1s. per acre per annum	20	0	0
Rates and taxes	2	0	0
Balance	86	17	1
	£247	10	0

	£	s.	d.
1900—By 1,800 bushels wheat, at 2s. 7d. per bushel ...	232	10	0
36 bags screenings, at 5s. per bag	9	0	0
200 acres stubble, at 3d. per acre	2	10	0
Wheat and chaff	3	10	0
	£247	10	0

In 1901, the expenses were £128 0s. 10d., and the return £19 3s., a loss of £108 17s. 10d.

In 1902, the year ended with a loss of £90 10s. 6d.

In 1903, there was a welcome profit of £152 11s. 8d.; but 1904 again showed a loss of £19 2s. 4d.

The crops of 1901 and 1902 were complete failures through drought. From the above figures it will be seen that these 200 acres in the Hundred of Eba have, in five years, given a total profit of £20 18s. 1d., and several small items of expense are not included, and nothing but the crop is allowed for.

Is it any wonder that southern farmers are flocking to Queensland, where the land is fertile and cheap, the rainfall plentiful, the average yields good, and where the soil yields two and more crops during the year?

LAID AND TWISTED WHEAT CROPS.

The wheat crop in this State for 1905 was unhappily a somewhat poor one owing to the persistent dry weather at the time when the young wheat imperatively demanded moisture. There was, consequently, very little if any which was high enough to become laid or twisted. But in the previous year the wheat grew to such a height—as much as 6 feet in some districts—that much of it was so laid as to be beyond the power of the self-binder to harvest successfully, and it had to be reaped with scythe or sickle. From the *Agricultural Gazette*, London, we learn that, by a simple attachment to the machine, the difficulty is entirely overcome:—

Experiments recently made with an improved style of reaper in the Seine and Marne Department of France give reason to hope that the difficulty of reaping laid and badly twisted corn crops may at last be obviated. Though

one may still see the scythe and even the sickle and flail in use in some parts, the scarcity of labour makes the use of improved machinery every year more necessary. In spite of the short notice given, these trials were attended by a large number of interested agriculturists. With upstanding or slightly laid crops these machines may be used in the ordinary manner, but with crops laid flat, where the knife slides over the crop, the newly invented system raises the straw for the knife to sever. These simple little appliances are called "releveurs" or "raisers." This raiser is a piece of metal fixed to and parallel with the knife frame. Different makers present slightly differing patterns, but the general principle is similar. This "shoe" has a slightly turned-up point which glides close to the ground, while close to its extremity is a second piece of metal or rod which raises the straw to a convenient height for the knife to cut. Some of these raisers are cast in one piece and resemble a flat-soled shoe. The raiser is not fixed rigidly, but given enough play to avoid breakage on meeting with stones or other obstructions. Each knife carries three of these raisers, which is generally found sufficient. The working is very simple. When the reaper comes to the laid part, the raisers in advance glide by means of their point between the ground and the straw and raise it from below to the upper part of the raiser, so as to be easily severed by the knife which follows, when the corn falls in the usual way upon the carrying band or platform, for these raisers are equally adaptable to all kinds of reaping machines. Very conclusive trials were effected with a plot of oats that most persons, judges included, considered too laid and twisted for any kind of reaper to deal with, but all were agreeably surprised, for after some preliminary trials the reapers started off in Indian file, and in less than an hour the whole piece was ready for stooking. It would be too much to say that a perfect job could be made of such a crop, but the cutting was regular if the form of the sheaves left something to be desired by the too critical eye, but that mattered but little, the general principle being triumphantly established. The trials took place on a level plain between Saacy Station and the village of Citry, and after luncheon the president, Mr. Jules Bernard, clearly pointed out the necessity for the use of such machines. Every year, in consequence of the scarcity of hand labour, the use of machinery is extending more and more. Ten years ago only 5,000 self-binders were imported into France, as compared with 10,000 at the present time, all from America, the French and English made machines being too few to mention. Mr. Bernard naturally expressed his surprise and regret at so large a sum being paid for foreign goods; but what surprised him most, and applies equally to us in England, was the fact that those in authority are so indifferent to inventions so important for the public good. Ministers and men of leading, if not of light, will visit shows of automobiles, cats or dogs, races or sports of all kinds, but have no time to spare for improvements which benefit our chief national industry and the food supply of the nation. Loud applause greeted this pointed allusion.

But as the most perfect machinery is of little use if out of the reach of the small farmer, who in France, and perhaps in the England of the future, proves himself the backbone of the national prosperity, perhaps the most important point of all is the system of co-operation which provides for the mutual use of expensive implements as practised at Thoringy. Here we find less than 80 acres of corn crops grown by seventeen farmers, or about 5 acres each, so that a machine for each is out of the question, as well as the team to draw it. For this reason farmers combine to buy a self-binder among them, and the president of the syndicate arranges as impartially as possible the order in which the machine and the necessary relays of horses shall be supplied to each member. In our villages a small committee of large farmers might settle this. So successful has this system proved that it has been extended to threshing machines and other costly agricultural implements. It will surprise your readers to hear that the whole harvest has been gathered in this way without any hiring of labourers or horses, and without any borrowing or annoyance or

obligation to any neighbour for aid. Here surely is an example well worthy of our imitation if our farmers would drop prejudices and jealousies and combine for their own good.

COMPLAINTS ABOUT BARLEY THRESHING.

The threshing of barley is an operation demanding considerable care and experience. Even in Great Britain, where every possible care is taken to ensure a perfect sample satisfactory to brewers and maltsters, complaints are frequently made of the damage done to the grain in threshing. In consequence of these complaints, the *Journal of the Board of Agriculture* has printed the following article on the subject, which will be distributed free in leaflet form:—

Complaints are frequently made by brewers and maltsters of the injury done to barley in the process of threshing, owing to the fact that the drum of the threshing machine is set so close that many of the grains are chipped or broken. The presence of these injured grains greatly deteriorates the value of the barley for malting purposes, as the broken, bruised, or skinned grains fail to germinate, and soon show signs of mould, thus leading to unsoundness in the malt and bad results in the brewery. The injury caused by over-dressing is not limited to those grains which are cut in halves; grains closely nipped at one or both ends, or such as have been bruised and peeled, are equally objectionable. In fact, if by too vigorous threshing the husk of the barley is damaged, although the damage may not be apparent, irregularities in the malting, accompanied by the production of mould, are likely to result.

When farmers commence a day's threshing, therefore, they should at the outset, and repeatedly during the day, carefully examine the grain. If any signs of injury are observed, the drum of the machine should be slightly opened. It is better that part of the beard should be left adhering to the grain than that any risk should be run of injuring the reputation and value of home-grown barley through having broken and chipped grains.

In this connection it may be useful to reproduce some observations by Mr. Hugh Baird on the importance of careful adjustment of threshing machines, which appeared in the *Journal of the Highland and Agricultural Society* in 1902. Mr. Baird pointed out that if, in order to get all the grain out of the ear, and especially when the barley is difficult to thresh, the drum and concave are set too close, there is obviously more danger of breaking and "nibbing" than when they are not so closely set.

A new machine will break the grain more than after it has been used for a time and the roughness of the beaters has been worn off. On the other hand, when a machine has been much worn, the centre of the drum and concave having had the most work, in consequence of the feeding being necessarily more in the centre than at the ends of the drum, the space or distance between them is greater in the centre than at the two ends, and if they are set to thresh clean in the centre they will be too close at each end, and consequently breaking will occur. This fault can only be remedied in putting on new drum-beaters and concave ribs.

Great attention should also be paid to regularity of feeding. The engine should be driven at an even speed, and proper care should be taken over the adjustment of the several parts of the machine.

It is not only in the drum of a threshing machine that unnecessary damage to the kernel takes place through imperfect setting of the several parts, but also in the barley-awner, through which the grain subsequently passes. Here, if the beaters are set too closely, and the barley is roughly handled, "nibbing" will take place. Different lots of barley require different treatment, so that those in charge of the threshing should make a point of constantly examining the sample, and if it is found to be injured in any way they should ascertain in what part of the machine the injury occurs, and should alter the setting until it is remedied.

FARMERS AND TAXATION.

Amongst the earliest needs of farmers in any country of the world may be reckoned roads. Roads and bridges and culverts are essentials which cost money, and the money, whether found by the Government or by shire councils, must be raised by some form of taxation, such as rates, for instance. But as it has been the time-honoured privilege of farmers to grumble at the weather, so is it also their privilege to travel on well-made roads, cut them up with narrow-tired wheels, excavate huge ruts with timber wagons, and then to exclaim against the rates by means of which such damages are repaired and the roads kept in good order for their use and benefit. Taxation certainly sits lightly on the Queensland farmers. How would they feel if subjected to the heavy drains described in the following from the *Oklahoma Farmer?*:—

When the American farmer is inclined to feel "gravely" over the conditions of his life he will find some consolation in the thought that farmers in other countries are worse off than he is. In England, for instance, farmers are compelled to take out more licenses to conduct their business than any other class of business men. Some idea of the enormous tax on English farming can be had from the following letter written by an English farmer to his brother in Michigan. He says:—

"First of all, in January, I had to write to the excise officer for a form of exemption to keep my old sheep dog. The form came back in about a fortnight. Then I had to fill it up and return it before I got the license to keep it free of duty. Then I had to visit the post office to get another license, which cost me 7s. 6d.; it is to keep a spaniel, so that I could hunt the rabbits from the hedge rows. Then I had to pay 10s. for a gun license in order to shoot the rabbits, and I had to go to another magistrate's clerk to have another license approved. This was for an assistant to keep the rabbits down on my farm, which adjoins woodlands. As occasionally I drive the missus to market and sometimes ask a friend to ride, I have again to go to the post office to get a 15s. trap license. A couple of months ago I injured my leg and could not climb up into my trap, so I purchased a light-weight four-wheel. A letter from the local officer of excise pointed out to me the fact that a license of a guinea had to be taken out. Cider running short, I had to provide something for my farm hands to drink, so I thought that I would obtain a couple of sacks of barley malt, the barley being grown in England, and brew a few gallons of ale. To do this I had to take out another license. I have a traction engine, with which I do my farm work, such as threshing, &c., and between whiles a bit of hauling. This necessitates my taking out the most expensive license of all, a ten-pounder. On the farm there are usually a few partridges and a stray pheasant or two, reared and fed at my expense. To shoot these I have to obtain a game license, which costs me £3. Now, I sell a few gallons of milk, and to do this I have to get my premises registered by the local medical officer of health. This is practically another license. Flowing right through my farm is a splendid trout stream, yet before I can attempt to entice one of the spotted beauties from beneath its surface I have to take out another license. If I send my sow to a neighbour, I have to go to the policeman for a license for her, which he issues on condition that she does not remain away more than four days. You may smile, but it's an official fact. If I sell my neighbour a few pigs, I have to obtain a license to remove them. If I send a lot of fat baconers to town to be killed, another visit to the policeman is necessary. If I decide to have them killed at home, I must have my farm building licensed as a slaughter-house. If I have only to turn my pig across the road to clover, again I have to visit that policeman. As all these licenses have been necessary for my business, and not one of them is for luxury, such as male servants or armorial bearings, I really think that the farmer can justly claim that his business is the most licensed in the kingdom."

FARMING IN RHODESIA.

The lot of the farmer in Rhodesia and in the Transvaal would appear not to be a very happy one. Take the railway rates for stock and produce, for instance, as given in the *T. S. and S. Journal*, Adelaide. That journal writes:—

Producers in Australia who are inclined to grumble at railway charges may take a kind of comfort from those which are made on the Rhodesian railway systems (says an eastern exchange). There, it is pointed out, to transport eleven horses 113 miles £3 13s. is charged, while for a further 188 miles £51 14s. was paid; then for the three principal classes of goods it is pointed out that while the charges on the southern line are from 1·77d. to 2·72d. per ton per mile, those on the Rhodesian line are from 6·26d. to 10·27d. per mile. A reform committee, which has issued a pamphlet, declares that these rates are effectively checking the progress of Rhodesia. It would almost seem as if the railways into Rhodesia were in advance of the time, since the population of whites is admitted to be under 10,000, and industry among the "unnumbered blacks" is hardly of a character to feed railway traffic. One of the proposed remedies is to get the Government to carry "the baby"—a course not unknown in Australia.

Concerning farmers' troubles in South Africa, we have—

Farmers and pastoralists may be interested in noting what the stock-owners in the Transvaal have to contend with in the way of animals killing their live stock. The Director of Agriculture there has just issued a scale of awards that will be paid for the destruction of the following animals:—

	s.	d.
Tiger or leopard	10	0
Wild dog	7	6
Jackal	5	0
Lynx or wild cats	5	0

So troublesome are these wild animals in places that the sheep and Angora goats have to be yarded in yards with high walls every night. Even then the leopard and lynx will not infrequently come over and play havoc with the flock.

The writer might have added lions, elephants, rhinosceros, &c., to the list without exaggeration. And the Queensland farmer or sheep-breeder, whose stock require no greater defence than a two-rail or barbed-wire fence to prevent their straying, cries aloud that he is ruined if a native cat has cut the throats of a few of his fowls or a native dog has worried a sheep. How would he like to be compelled to build high concrete walls round his yards, and shepherd the stock by the aid of men armed with rifles? Queensland is still to some extent habitable by farmers and squatters.

FARMING IN MEXICO.

Without at least 30,000 acres in his estate a Mexican farmer is considered a poor man. Some of the haciendas, or plantations, contain nearer 100,000 acres, and there are many that embrace more than 1,000,000 acres. Like the estates of the old world, these vast tracts have been in the same family for generations, and the title deeds in most cases show that they were practically gifts from the King of Spain, made in the days when Mexico was a part of New Spain, and it was considered the graceful thing for the reigning monarch to reward the adventurous soldiers who wrested the land from the natives.

The following figures show the actual production of an hacienda of only 30,000 acres last year:—56,000 bushels of wheat, 200,000 bushels of corn, 2,000 bushels of barley, 4,000 bushels of beans, 8,000 dollars worth of chile peppers, 6,000 dollars worth of sweet potatoes, 2,000 dollars worth of quinces,

1,500 dollars worth of straw, 8,000 dollars worth of watermelons, 2,000 dollars worth of sugar-cane, and 8,000 dollars worth of garbanzos (chick pea).

In addition to the income derived from the sale of grains, fruits, and other crops, fat cattle brought 12,000 dollars, 100 mules brought 4,000 dollars, 300 oxen brought 10,000 dollars, and 1,500 goats brought 2,250 dollars.

The average weekly expense of operating this hacienda last year was a little more than 1,800 dollars.—*Mexican Herald*, 6th August.

In British currency, the grain, fruits, and other crops sold for £43,940, and the live stock realised £3,531, a gross total of £47,471. The Mexican dollar is here taken at 2s. 6d. Where sisal hemp is grown, the yearly returns of a farm such as is above described would be greatly increased, 5,000 acres of sisal producing a gross return of £75,000.

Wages must contribute a mere trifle of the expenses, seeing that the weekly expense of such an estate only amounts to £250, or to 2d. per acre per week.

NITRATES AND PHOSPHATES REMOVED BY LIVE STOCK.

Not only are nitrates and phosphates sold off the farm in grain, but in the bodies and bones of live stock. The albuminoids in milk carry away nitrogen, and the bone earth carries away phosphates. Less objection is taken to the depletion of these valuable materials by sheep and cattle, because it is generally compensated for by fertilisers and foods purchased. Nevertheless, it exists, and I have taken out the amounts from the elaborate experiments made at Rothamsted. A store sheep weighing 100 lb. removes 15 per cent. of its total live weight of nitrogenous matter, which may be taken as containing 15 to 18 per cent., or rather over 2 lb., of nitrogen. It also removes from 3 to $3\frac{1}{2}$ per cent. of its total live weight of mineral matter containing 40 per cent. of phosphoric acid, or from 1·2 to 1·4 lb. As a crop of 30 bushels of wheat removes 14 lb. of phosphoric acid, ten store sheep averaging 100 lb. each live weight are as exhausting in their effect upon the soil which produces them as an acre of wheat. As regards milk, the total annual yield from one cow may be taken, according to Aikman, as entailing a loss of 11 to 12 lb. of phosphoric acid and 22 lb. of nitrogen; and, as these figures are calculated upon 430 gallons of milk, it is evident that a cow yielding 600 to 700 gallons per annum will exhaust land of phosphoric acid and nitrogen approximately to the same extent as an acre of wheat. A flock of 500 ewes and a dairy of sixty cows might, therefore, be as exhausting, in terms of phosphoric acid, as 100 acres of wheat yielding 30 bushels per acre. The actual exhaustion depends entirely upon the amounts of phosphoric acid and nitrogen imported on to the farm in the form of foods and fertilisers; but, if the live stock are maintained on home-grown produce, the exhaustion will be as actual as if 100 extra acres of wheat were grown.—*Exchange.*

ONION-GROWING IN THE ROSEWOOD DISTRICT.

By J. W. EVANS.

Nearly all the farmers here on the hills have their patch of onions. Sometimes they pay very well, and at others they are not so profitable; but, if taken one year with another, they are decidedly profitable. One farmer says he will have over 4 tons from an acre of ground, and he expects about £17 a ton for them. Those who have a good crop this year will do very well with them.

Onions do best here on a sandy loam, and if wanted early, where it is warm, as it would be, near a belt of scrub, only not on the southern side, the yield will not be so great perhaps as it otherwise would; but, if they are earlier, the extra price paid will make up for the difference.

Onions grown from locally-grown seed mature earlier than those grown from seed imported from Sydney or Melbourne. Only the best onions are kept for seed, and those who have saved seed always have a ready sale for it.

Brown Spanish are grown for this purpose. White onions will not keep long enough to plant again to raise the seed. It is not advisable to preserve the seed of onions which flower during the first season, as it only runs to seed again, and no onions will be produced.

Brown Spanish are chiefly grown, but some farmers plant White Barlatta as well. If one kind will not grow, the other might. The white realise the higher price early in the season, are the heaviest croppers, and are the earliest of the imported seed.

How to Grow.—Plant the seed in beds, and transplant afterwards. It is easier to look after the young plants in beds, and to water them, and quicker to transplant them than to keep the weeds out if they are planted in rows at first. When making beds, get a piece of ground that has been cropped before, and chip over to a depth of 2 or 3 inches, and clean off the weeds if any. Any seed will come up in ground treated in this manner quicker than if it was fresh ploughed or dug. Before planting the seed, just damp it, and sprinkle with flour, so that when planting you will be able to see where the seed is going, and not get the plants too crowded. Then cover lightly with soil. More seed is spoilt by being covered too deep than by not being covered deep enough. . Then water the beds well, and cover with bags or with a mulch. Then water again. Sawdust is sometimes used to cover the beds. When the onions are showing above ground, remove the mulch or bags. The seed should be planted about the end of March. The ground for the onions should be ploughed about the same time, and cross-ploughed about a month later, and allowed to lie and sweeten till it is wanted, which should be in June.

When ready to plant, which should be early in June, if the weather is favourable, water the beds well, and pull up the onions. Then cut off some of the top and some of the roots. If this is done, they are easier to plant, and strike quicker. Plough the ground, and plant on every furrow. This gives planty of room for the onions as well as for the hoe, and also saves a lot of labour. Then when the planting is done you have to keep the crop clean. Chip not only to keep the weeds down, but also to keep the moisture in. Do not chip the soil on to the onions, but rather away from them.

When the stem dies back, as it ought to do in the early part of November, pull up the onions and lay them in heaps till the tops are dry. Then clean them, and pack them in bags. Do not spoil the market by bagging them before they are fit. You might gain on one lot, but you will certainly lose on the next. Dry the onions properly, pack them properly, and keep up the price.

SHEEP ON THE FARM.

As many farmers in Queensland have entered upon the business of sheep-breeding and raising lambs for export, we propose to keep them posted in all information of interest to them in what may be termed a new and rising industry. South Australian farmers have long recognised the value of a flock of sheep on the farm. The opinions of some of these, as published in the *South Australian Journal of Agriculture*, are here given. Mr. W. Morrish, of Crystal Brook, says:—

Sheep are more profitable than cows on the farm. Sheep are a distinct help to the farmer, apart from the revenue they bring in. They assist to clean the land by eating down the weeds, thus saving a good deal of labour in working the land. Unlike dairying, sheep involve the farmer in no particular labour, an important item where, as is so often the case, nearly all the work of the farm is done by the farmer and members of his family. Apart from being of value in reducing the labour on the farm, sheep will return to the farmer a

greater profit than cows or other stock. The development of the export trade has given a profiable outlet for their lambs, and ensured that such low prices as have ruled at times in former years will not occur again. Taking all things into consideration, he thinks that for the farmer the large-framed, strong-woolled merino sheep are best, especially when the revenue is to be derived mainly from wool and mutton. In keeping cows, the farmer in the Northern districts has many difficulties to contend with. Not only are the seasons frequently too dry and feed scarce, but suitable labour is not available. Dairying at all times requires special and careful attention, and, in addition, this extra labour proves too great a tax.

Mr. W. Smith, of Port Pirie, found sheep a very useful adjunct on the farm. They converted such waste products as wild oats and other weeds into money value, and assisted to clean the land. Sheep were very useful on the fallows; but they must not be kept too long there. The stubble, which was often largely wasted, could be put to good account by sheep. When the crop has been blighted by hot winds, and the stubble is thin, sheep eat it very readily. Lamb-breeding was very profitable to the farmer. He had best results from crossing merino ewes with Southdown rams, and he advised the farmer when starting to buy good six-toothed or full-mouthed ewes. In mating maiden ewes with Down rams there are likely to be losses in lambing, as twin lambs are frequent. The Down or crossbred lambs are far more docile and contented than the merino, and, of course, mature much quicker. The backward lambs should be kept by the farmer for killing later on for mutton, as he can grow mutton cheaper than he can buy it. The sheep droppings will be useful for manuring the land. If the manure from the yards is gathered and kept dry, it can be mixed with super, and sown with the drill. He had mixed about 50 lb. of super with a wheatsack of sheep manure, and applied this to about 3 acres, with good results. To distribute the manure, the drill was opened to its greatest capacity. He was satisfied that, with good management, sheep were a source of profit to the farmer.

Mr. A. Barrett, Noarlunga, speaking of the best type of farmers' sheep considers that, for those who only keep a few sheep to supply the home with meat, and to have a few fat sheep for sale at times, the progeny of a Lincoln-merino ewe, mated with a Shropshire ram, cannot be surpassed. They are good mutton sheep, quick growers, very quiet and hardy, and will thrive under adverse conditions. They have the length and breadth of the Lincoln, combined with the low-set, weighty characteristics of the Shropshire, and as a two-tooth are usually equal to a four-tooth merino. The sheep will give a nice cut of wool, though light—about 6 to 7 lb. In the Southern districts, where the rainfall was better, the Lincoln-merino ewe, mated with the Shropshire ram, will give a splendid lamb. The ewes are splendid mothers, very quiet, and will give a high percentage of lambs. On larger holdings, where wool is the main source of revenue, the merino, of course, is the best sheep. The merino wether also sells better than other breeds.

As regards lambing, Mr. R. A. Montgomery, of Dowlingville, says it is of the utmost importance to the farmer that his ewes should lamb at the right season of the year. Here, on Northern Yorke Peninsula, this was during May and June, as the lambs will have four to six months of the best part of the season, the grass becoming more abundant and nutritious as the lambs are coming on. By the end of October they should be fit for export; any that are not fat will make good stores later on, and will cut a good fleece. The lambs will be old enough to wean in time for the ewes to be fattened off before the feed dries—a matter of no small importance to the many farmers who buy old station ewes. Should good early rains fall, more profit might be obtained from March and April lambs; but this is too uncertain for the farmer to risk, as dry feed at lambing would mean failure. Too often a ram is put with a flock of all sorts of ewes directly after shearing, and allowed to remain for some months. The result is that lambs are dropped at all seasons of the year, old ewes starve

to death while suckling lambs, and there is nothing fit to kill, except some of the best young ewes, which are probably in lamb. At shearing time the farmer has half a dozen classes of wool in as many bales, and his sheep have learnt to creep through the fences, so that, instead of being profitable, they are a source of worry and trouble to himself and to his neighbours.

THE LAMB EXPORT TRADE.

A Victorian farmer (says the *Pastoralists' Review*), evidently a keen observer and practical man, who returned from a visit to the old country recently, gave the Melbourne *Age* a very interesting interview on the lamb export trade and its prospects. When speaking of the markets and cost of production, he said that homebred lambs, either English, Scottish, or Irish, when topped up prime to weigh between 32 lb. and 36 lb., realise from £1 7s. to £1 15s. per head. These prices may appear high to the Australian farmer, who can only get from 10s. to 16s. per head for their lambs, but it is pointed out that at home, where they are forced to feed on turnips, &c., it costs quite £1 5s. each to top up lambs really properly. Out here—he refers to Victoria particularly—a large majority of the lambs are raised on wheat farms worked on a rotation of one-third crop, one-third grass, and one-third fallow. The grass has been particularly good this year, and although the best results are obtained by the addition of succulent fodder, such as lucerne and rape, still it does not cost anything like 10s. a head to prepare lambs for the freezing works. The conclusion he draws is that Australia can produce lambs cheaper than, or as cheap as, any other country, and while this is the case the export trade is bound to go ahead.

He noted a further important point in our favour in the fact that the highest-priced months in the British lamb market are from the middle of October to the middle of January, which just fits in with our spring season of abundance. Again, there is a steadily increasing tendency throughout Great Britain towards lamb consumption generally. It is found to be more digestible than other meat, and there is less waste.

THE WHEAT HARVEST.

It is pleasing to learn that from several districts satisfactory news comes concerning the probable wheat harvest. A short time ago, fears were entertained that the harvest would prove practically a failure, owing to want of rain. At most only half a crop was expected, under the most favourable circumstances. Last week, however, has shown that some very good yields have been harvested—in some instances as much as from 25 to 29 bushels per acre. It is quite too early to arrive at even an approximation of the coming crop, but that it will surpass all expectations appears to be a settled opinion. An opportune fall of rain during October had a wonderful effect upon the crops then coming into ear. Fields which had been almost despaired of recovered to such an extent that certainly half a crop will be harvested. Owing to the excessive dry weather of the past four months, and the consequent scarcity of fodder for dairy cattle, many farmers were compelled to sacrifice young wheat for their stock, which would possibly have returned a good yield of grain had it not been cut for fodder.

This brings us to the question of mixed farming. It is certain that the seasons are not to be depended upon for any crop; therefore, it is advisable to have more than one string to the bow. On the Darling Downs mixed farming is

every year being carried out to a greater extent; and one of the most profitable means of occupying the land is the grazing of sheep, it being the cheapest, the most profitable, and one of the best means of manuring.

It will pay any man who puts in 100 acres of wheat or other crops every year, and who has 100 acres fallow, to keep sheep. Thirty ewes and a ram will generally return twenty-seven or twenty-eight lambs, frequently many more. These lambs are worth from 10s. to 14s. each. Then there is the wool off the ewes, an item which will return an average of from 4s. to 6s. per sheep. If a farmer has a few acres of lucerne, he can keep far more than the above number of sheep by feeding them in the paddocks.

With 700 acres, a farmer should be able to realise £100 a year from his wool and lambs alone. Sheep on the farm give many advantages and profits which could not otherwise be obtained. There is no industry in the State, unless perhaps it be dairying, that gives so much promise as this matter of keeping sheep and breeding the best sort of lambs for export.

On the coast lands, the breeding of sheep might be attended with some success in some districts; but where—as on the coast—wheat cannot be profitably grown, and where sheep do not succeed, there are other compensations, especially dairying and cotton-growing. The latter crop is a highly-paying one, and the plant will stand dry weather better than any other farm crop, unless it be sisal hemp, which thrives in the most arid districts, and grows on regardless of heat or drought.

Our object in writing the above is to keep well before the farmers the great need for mixed farming. Then, if one crop fails, another will probably succeed. If fodder fails for the sheep, they can be taken to where fodder and water are plentiful, and returned to the farm when conditions have become favourable. But the standing crop must take its chance, and that chance in a four months' drought is a very doubtful one.

STUMPING LAND.

The Trewhella Jacks.

There have been many inventions having for their object the easy and expeditious removal of standing trees and stumps. Some of these, such as the "Forest Devil," are effective, but clumsy and expensive; others are worked by light wire ropes, pulleys, and a windlass, the latter most serviceable in the case of stumps not exceeding 10 or 12 inches in diameter. In scrub lands newly cleared, the array of stumps would appal the stoutest heart were he not cognisant of the fact that, within about three years, most of them would have rotted out. What has always been the great desideratum is a simple machine requiring no horse-power to work it, and which yet shall be capable of exerting a lifting power of several tons by the labour of one man.

Such a machine has just been introduced into Queensland by Messrs. Trewhella Brothers, of Victoria. It appears to be an improvement on the old hand jack used in Europe for raising logs and heavy stones on to trollies.

For grubbing trees, stumps, roots, &c., these jacks are extensively used in all the timbered districts of the Commonwealth, the mode of action being as follows:—For roots, small stumps, and trees, little or no digging is required. If the stump is tall enough, place the foot of the jack 12 or 18 inches from the base of the stump, and stick the top point into the wood. Work the lever, and the ram of the jack extending will start the roots. When the jack is fully extended—if the stump is not quite out—chock it up, and get a lower grip. Roots and stumps which are too low for top of jack to catch must be lifted with bottom point. For this purpose dig round the strongest root and cut it off a short distance from the stump, then place the foot and bottom hook under

the side of root, and work lever as in other case. Where ground is soft it is often necessary to place a flat piece of wood under the foot of the jack to prevent it sinking, and in grubbing a piece of strong chain, about 4 feet long, is useful at times. In grubbing large stumps and trees it is generally necessary to dig round them, more or less, according to the state of the ground, and to cut some of the surface roots. Anyone having experience of this class of work knows that in grubbing the most difficult work is in getting at the tap root and other roots which go down; these the jack will root out without cutting. For handling logs at sawmills and in land clearing, these are the simplest and most effective jacks on the market.

Mr. Trewhella says that these jacks are used in large numbers in Victoria and New South Wales, and by way of introducing them into Queensland an agent (Mr. A. Robinson, Civil Service Stores) has been appointed, and a travelling plant will be sent in charge of an operator into all the rural districts, where he will give practical demonstrations of the value of the machine. Not the least of its recommendations is its remarkable cheapness.

Demonstration at Nudgee.

On Thursday, 23rd November, Mr. Trewhella gave a demonstration of the working of the machine on the grounds of the Nudgee Orphanage. There was a large attendance of neighbouring farmers and of others from the city, who were interested spectators of the trial. Mr. Trewhella and his expert, Mr. Miller, were present to demonstrate the value of the machine. The trial took place in a paddock adjoining the Nudgee College, about a quarter of a mile from the railway station. There were present representatives of the Agricultural Department, the Railway and Lands Departments, of several shire councils, of business firms in the city, and a number of local farmers and others from a distance. The first trial proved to be the most formidable. A dead ironbark stump, 15 inches in diameter at the surface of the ground, had been chosen for extraction. It should be stated that the soil was baked hard owing to the absence of rain sufficient to soak the soil for the past four months. The surface soil was not disturbed, nor were surface roots cut. In a few minutes after the application of the machine the surface roots creaked and broke, but there was a large tap root to be reckoned with, which necessitated the loosening of the top soil. In twenty-four minutes the stump was extracted. It presented a triple row of tough side roots, and the tap root, of nearly the same thickness as the stump, was 3 feet 9 inches long. Two machines drew this perpendicularly from the ground in the time mentioned. Two men worked the handle of the extractor. The next trial was on a standing bloodwood tree, 8 inches in diameter. It was lifted straight out of the ground. The tap root was 18 inches long. For the third trial, a growing white gum, 18 inches in diameter, was lifted out of the ground in fifteen minutes, the surface not having been disturbed. This work met with universal approval by all the practical men present.

Finally the powers of the jack in the way of log-rolling were shown. An immense solid tree, about 4 feet in diameter, was lying at right angles to a fence. The tree was estimated by the representative of the Railway Department to weigh about 3 tons. This was lifted by Mr. Trewhella and Mr. Miller, and carried round parallel with the fence in eighteen minutes. The work could have been carried out in half the time had it not been for the constant requests to "stop and explain."

All present were satisfied with the work done, and declared that in scrub land trees of the same size could have been taken out in from five to ten minutes.

At the conclusion of the trial, Mr. Trewhella was heartily congratulated by those present. Mr. Miller starts at once on a tour through the country districts to give demonstrations and take orders for the machine.

QUEENSLAND AGRICULTURAL COLLEGE.

Grade Sheet—June, 1905.

Division.	—	Agriculture, Theory.	Arithmetic.	Botany.	Chemistry, Theory.	Chemistry, Practical.	Gardening, Theory.	Dairying, Theory.	Bookkeeping.	Elementary Science.	English.	Pig-raising and Bacon curing.	Veterinary Science.	Mensuration.	Poultry & Bee Keeping.	Surveying.			Blacksmithing.	Carpentering.	Dairying, Practical.	Farming, Practical.	Gardening, Practical.	Conduct.	Diary.
Third.	A. Blomfield ...	89	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	80	...	80	92	...	100	...
	R. Macdonald ...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	..	...	..	...	...	70	80	93	100	...
	E. Peirce ...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...	...	75	40	...	84	90	95	...
	A. Smart ...	92	...	69		75	97	92	...	...	...	86	68	...	87	..	...	...	...	80	...	95	98	100	...
Second.	R. Baker	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	70	...	60	75	82	70	...
	D. Binnie ...	...	...	...	..	..	..	86	...	...	...	...	...	...	...	...	...	...	...	90	90	80	...	100	57
	B. Bone	72	...	34	...	38	87	88	...	...	...	60	29	...	77	30	.	..	...	60	...	85	...	100	51
	N. Dixon ...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	..	...	...	...	60	56	76	90	85	...
	R. Harvey ...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	60	68	78	91	100	...
	H. May	91	...	84	84	61	84	97	...	..	...	85	70	...	90	87	.	...	...	...	...	79	87	79	53
	J. McCready ...	71	...	64	93	63	81	72	...	..	...	73	57	...	70	39	...		...	...	...	77	90	70	42
	A. McNab ...	70	...	35	58	54	71	95	...	..	...	83	30	...	87	73		..	...	70	...	81	86	100	59
	K. Moffat ...	91	...	88	91	78	94	92	...	...	...	90	71	...	91	91	..	..	65	80	...	77	97	85	41
	W. Patrick ...	68	...	23	27	30	69	83	...	...	...	82	51	...	76	11	...	...	...	80	58	79	92	90	35
	F. Poeppel* ...																								
	E. Robinson ...	73	...	29	39	47	85	75	...	...	...	75	48	...	71	24	...	...	75	...	...	79	84	74	43
First.	O. Anderson ...	48	3	0	15	...	60	54	10	...	...	59	10	2	31	...	...	...	..	70	40	80	70	75	51
	P. Blaney ...	49	21	17	14	...	60	50	13	...	...	52	20	4	41	...	...	...	40	...	40	70	62	95	35
	A. Bone	58	48	26	42	...	70	83	57	...	...	71	48	79	51	..	...	...	...	80	40	80	96	90	56
	G. Campbell ...	61	50	23	20	...	79	66	71	...	...	65	28	77	...	...	...	...	75	90	50	88	90	100	53
	C. Cardew ...	...	.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	80	60	...	...	...	100	...
	E. Casey... ...	55	7	24	.	...	63	56	21	...	...	65	20	0	44	...	...	...	...	60	40	76	75	90	60
	A. Clarke ...	74	57	28	50	...	76	90	78	...	...	90	67	75	60	...	...	...	45	50	50	79	83	100	64
	T. Clarke ...	52	23	20	39	...	83	63	38	...	...	60	43	44	51	...	..	...	...	...	50	78	...	100	61
	J. Clark	59	8	16	14	...	81	64	29	...	...	55	18	8	38	...	...	...	...	...	40	79	87	80	59
	S. Hays	...	...	...	...	.	.	...	...	...	...	...	...	...	...	...	...	..	...	...	50	60	...	100	...
	H. Iwers ...	51	30	30	40	...	78	66	84	...	...	65	33	42	31	...	...	...	60	...	...	76	86	80	50
	H. Jones ...	73	65	62	51	...	74	70	79	...	...	88	45	92	73	...	...	...	...	...	55	65	83	100	58
	J. McDermott ...	...		...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	42	70	...	100	...
	R. Mackellar ...	75	74	30	53	...	78	81	76	...	...	60	70	71	46	...	..	...	...	...	55	79	80	95	49
	R. McIntyre ...	59	44	14	19	...	75	61	22	...	...	62	46	20	47	...	...	...	..	60	...	77	90	100	43
	L. Martin ...	69	18	23	39	...	83	84	65	...	...	92	22	26	59	...	...	...	65	50	...	82	87	100	59
	K. Molony ...	...	...	...	...	...	..	...	...	...	..	...	.	...	...	...	...	...	...	40	50	70	60	60	...
	A. Philp	88	94	62	84	...	91	94	92	...	...	80	39	95	76	...	...	...	...	90	75	80	96	100	50
	W. Rendle ...	90	81	34	80	...	95	96	95	...	...	90	80	76	82	...	..	...	60	...	...	71	81	80	66
	G. Richards ...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	70	87	100	...
	G. Robertson ...	...	92	...	91	.	...	...	97	...	...	...	48	82	...	...	...	...	...	...	75	83	92	100	62
	H. Scheu ...	93	72	52	81	...	71	93	93	...	...	91	49	90	74	...	...	...	...	...	55	77	81	100	66
	H. Stevens ...	56	70	25	70	...	84	63	89	...	...	63	55	100	81	...	...	...	...	80	60	82	87	100	47
	R. Stumm ...	91	87	89	91	...	94	96	99	..	...	93	84	94	87	...	...	...	...	70	...	83	96	100	69
	N. Walker ...	..	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	70	68	75	...
	E. Wall	83	87	57	63	...	76	89	88	...	...	70	63	81	63	...	...		...	...	58	83	91	100	54
	W. Wilkie ...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	60	76	89	75	...

* Left College in March.

JOHN MAHON, Principal.

LAND MEASUREMENTS FOR FARMERS.

In the measurements given in our October issue four errors occurred. The correct figures are:—

Feet per acre.—For 129 by 363, read 129 by $337\frac{1}{2}$ (nearly).

Yards per acre.—For 80 by $60\frac{1}{2}$, read 80 by $69\frac{1}{7}$.

Chains per acre.—For $2\frac{1}{4}$ by 4, read $2\frac{1}{2}$ by 4.

Chains per acre.—For $3\frac{2}{3}$ by 6, read $3\frac{2}{3}$ by $2\frac{8}{11}$.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 30TH SEPTEMBER, 1905.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Cocky ...	Ayrshire	28 April, 1905	667	3·7	27·64	
Lottie ...	"	6 Aug. "	753	3·8	32·04	
Loss ...	"	11 May "	648	4·0	29·03	With first calf
Lass ...	"	6 Feb. "	621	3·7	25·73	
Ell ...	Jersey	21 Aug. "	695	4·5	35·02	With first calf
Dripping ...	Holstein Devon...	18 July "	643	3·5	25·20	
Whitefoot ...	Holstein Sh'rth'rn	11 July "	783	3·5	30·69	
Nambour ...	" "	18 Aug. "	674	3·6	27·17	With first calf
Burton Whitefoot	Shorthorn ...	6 Aug. "	851	3·8	36·21	With first calf
Rose ...	"	11 June "	833	3·6	33·58	
Princess ...	"	1 Aug. "	805	3·6	32·45	
Louisa ...	"	1 Aug. "	841	3·7	34·85	
Dolly ..	"	1 Aug. "	724	3·6	29·19	With first calf
Nellie 2nd ...	"	14 Aug. "	735	3·7	30·45	With first calf
Roany ...	"	3 Aug. "	693	3·5	27·16	
Dora ...	"	18 May "	671	3·8	28·55	
Kit ...	"	17 Mar. "	651	3·8	27·70	
Restive ...	"	30 Aug. "	653	3·6	26·32	With first calf
Lemon ...	Grade Shorthorn	18 Aug. "	785	3·7	32·53	
48 ...	Ayrshire Sh'rthrn	11 July "	854	3·6	34·43	

Mornings and evenings fed on green Nepaul and Cape barley, and grazed on lucerne field for two hours during the day.

DANISH RULES FOR DAIRYMEN.

All the Danish creameries issue the following set of rules to dairy farmers:—

MILKER, MARK THIS WELL.

1. The cow is a living machine.
   (*a*) Kindly treatment entails less labour and gives more milk.
2. Good work improves the living machine.
   (*a*) Milk clean. Clean milking develops the udder, and with this increases the quantity of milk, and
   (*b*) You receive richer milk.
   (*c*) Remember that the milk last drawn is by far the most valuable.
3. Cleanly milking.
   (*a*) You should wear tidy and clean clothes.
   (*b*) Have the milk pail clean as well as the creamery can.
   (*c*) Thoroughly clean the udder by rubbing with a piece of linen.
   (*d*) Wash the hands thoroughly before milking.
   (*e*) Let the udder be quite dry before you begin to milk.
4. Carry out the work properly.
   (*a*) Milk with dry hands.
   (*b*) Seize the teats with the whole hand.
   (*c*) Keep a gentle pressure on the udder.
   (*d*) Milk as fast as you can, and never cease working until the milk is wholly drawn.
   (*e*) Don't strain the teat beyond its natural length.
   (*f*) Remember the value of the last drops.

5. Healthy state of the udder.
   (*a*) If there be soreness or lumps in the udder or teats, stoppage in the milk canal, or unnatural coloured milk, don't mix the milk with any other, and don't send to the creamery.
6. Milking times.
   (*a*) Begin milking always at fixed times.
   (*b*) Milk the same cows in the same order.
7. Regard this excellent work as one of honour.

FARMER, MARK THIS WELL.

1. Clean the cows.
2. Have good air in the stalls.
3. Light should be freely admitted.

MAKING BUTTER IN ONE MINUTE.

At the dairy show held in London last December, a churn was exhibited which produces butter in one minute. It is called the "Howes" churn. The *British Trade Journal* thus refers to it:—

This is a practical invention, by the aid of which butter can be made to come after about one minute's turning, and this can be done with either sour or sweet cream. The butter produced is of an excellent grade of granular, and the working is as easy as it is rapid. The invention undoubtedly enables private families and small users of butter who are in possession of cream to turn out fresh, pure, and wholesome butter for table use every day. The machine can be had in seven standard sizes, known as the 1-quart, 1-gallon, and 3, 5, 7, 9, and 13 gallon sizes. Each of these will churn about half the quantity stated, the remaining space being occupied by the dasher. At this exhibition a still smaller size was on view, in which the barrel or body is of glass, and which will, we are informed, produce from $\frac{1}{2}$ to $\frac{3}{4}$ lb. of butter at a time.

The advertised cost of the 1-gallon size is £2.

Further particulars and prices can be had from the S. Howes Company, 64 Mark lane, London, E.C.

CONTAGIOUS ABORTION AMONG CATTLE.

By A. H. CORY, M.R.C.V.S. Lon.

This disease is now looked upon as being highly contagious, and one which causes serious losses and trouble to the dairy farmer, not only owing to the loss of milk and progeny, but also to a sterile condition to which a number of the cows are reduced, after having suffered from this complaint.

Cause.—Experience convinces us that an organism is the cause, but, from a scientific standpoint, much still remains to be proved. At the present time investigations are being carried out, in various parts of the world, with a view to discovering the actual cause and the best treatment to be adopted. Bang and Stribolt in their investigations found an organism, a non-motile bacillus (rod-shaped organism), which, when inoculated into pregnant cows, produced abortion; and they further found, that, from the examination of mummified fœtuses, these bacilli remain virulent for at least seven months. Other veterinary surgeons have stated that, if the excretions from the genital organs of cows which have aborted are transferred to the vaginal mucous membrane of healthy pregnant cows, abortion will follow.

Symptoms.—The symptoms vary considerably. In some cases, all that is noticed is that the cow keeps returning to the bull (it must be remembered that this is also noticed when due to other causes, such as malformation of the mouth of the womb, &c.); in other cases, a cow may appear uneasy, and is apparently going to calve.

If cows are carefully attended to, it will generally be noticed that there is a thick, dirty, red discharge coming from the vagina; this often commences some three or four days before abortion takes place. The mucous membrane of the vagina is somewhat darker in colour than normal, and small pimples may be seen on its surface. The udder is occasionally swollen, and the quantity and quality of the milk are considerably altered, being less in quantity and more like beastings in quality.

Treatment.—Various treatments have been tried, such as the injection of carbolic acid solutions under the skin; also drenching with carbolic acid and other medicinal agents, but the following has undoubtedly given the best results:—When a cow aborts, she should immediately be isolated from the rest of the herd, and it is of the greatest importance that the fœtus and afterbirth should be at once found; these should then be destroyed by burning on the spot, or buried deeply in quicklime, care being taken to thoroughly disinfect the ground for some yards around the spot where the abortion took place; this can be done by burning or by covering with lime or some other disinfectant. The vagina and uterus of the cow should now be irrigated daily for six or seven days with an antiseptic solution. After this period has elapsed, the cow should be irrigated about twice weekly until the discharge from the vagina ceases. At the same time, the tail and hindquarters of the cow must be well washed with the solution.

The best antiseptic solutions are either carbolic acid, 1 part to 100 parts of water, or corrosive sublimate, 1 part to 1,500 or 2,000 parts of water; the stronger solution is recommended for the first six or seven days. Both these solutions are poisonous, so that the necessary precautions must be taken; but the latter solution will probably be found the more convenient to use, as it can be purchased in the form of tablets of various strengths. Thus by taking one or more of these tablets (according to their strength), and *thoroughly dissolving* in a pint of tepid water, the required solution is ready for use.

Instructions for Irrigating the Vagina and Uterus.—A piece of rubber tubing should be procured, about 4 feet long, and about ½-inch in diameter. To one end of this tube attach a funnel, preferably one made of glass or enamelled. The free end of the tube is now gently inserted by the hand into the vagina, and thence to the mouth of the womb; the funnel is raised as high as the tube will allow, and the solution steadily poured into the funnel.

Precautions.—The hands and arms of the person using same should be thoroughly cleansed in hot water in which there is some disinfectant. Before and after using on each cow, the funnel and tubing should be washed in boiling water to which some disinfectant has been added.

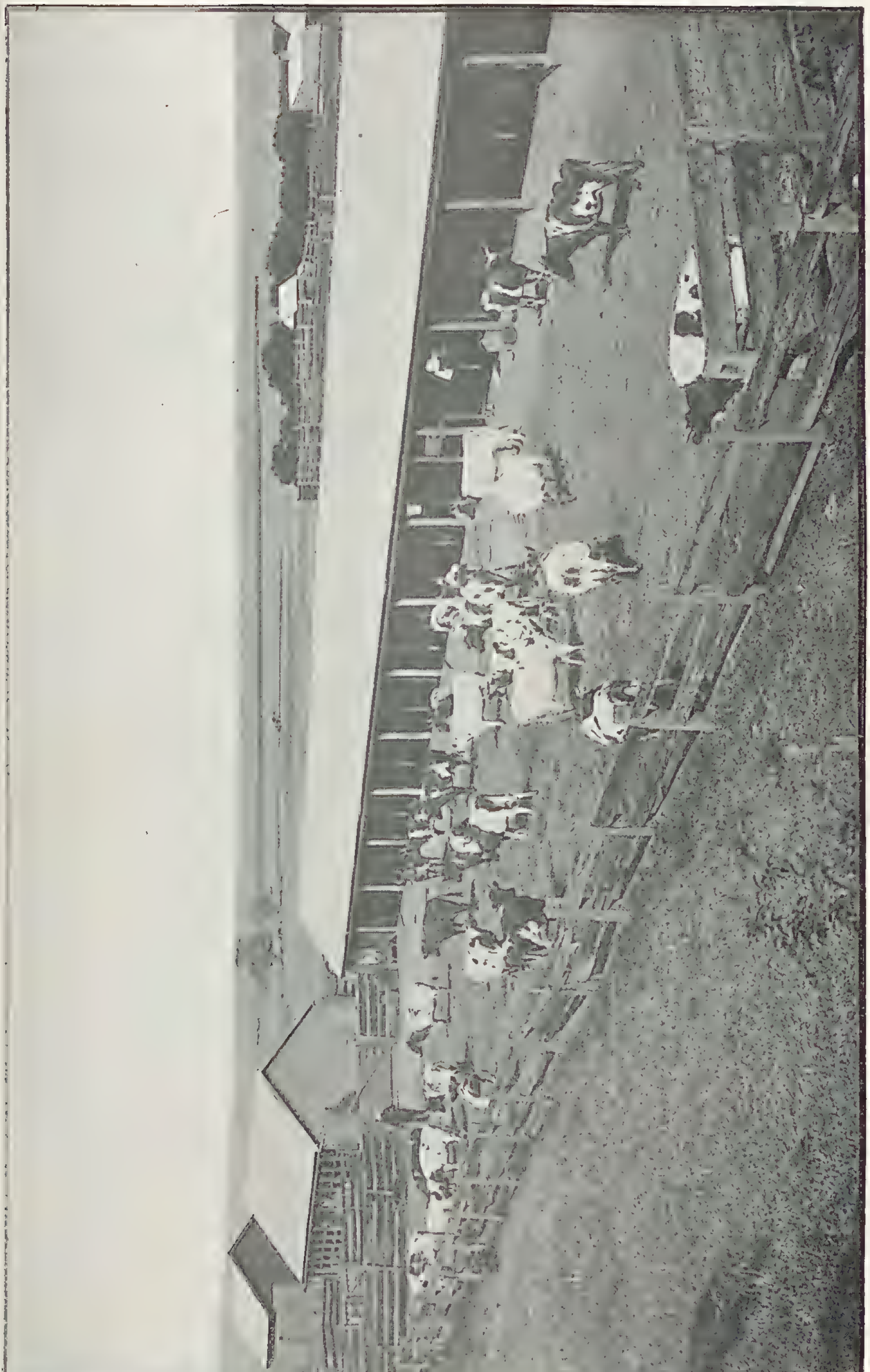
When contagious abortion has affected a number of cows in the herd, it has proved very beneficial to irrigate the vagina of all pregnant cows once or twice weekly from the third to the seventh month of pregnancy. The weaker solution can be used—viz., 1 in 2,000. Great care must be taken not to injure the mucous membrane of the vagina, by passing the tube too forcibly; as in this case the tube is only passed into the vagina, and not into the mouth of the womb.

As soon as contagious abortion makes its appearance in the herd, the bull should also receive attention. The sheath must be washed once or twice a week with either of the above-mentioned antiseptic lotions. For this purpose, a Higginson's syringe is best adapted.

THE DAIRY HERD AT ST. HELENA.

For several years past careful attention has been given to the formation of a herd of purebred dairy cattle at the Penal Establishment at St. Helena. Great interest is taken in this work by the officials, and the result of their labours has been to raise a herd second to none in the State. At the outset,

Plate VII.



The Dairy Herd and Milking Sheds, H.M. Penal Establishment, St. Helena.

Plate VIII.

Imported Ayrshire Bull, "Ardgowan King Fritz."

many difficulties were encountered, not the least of which was the disease known as tuberculosis. In 1898, it was discovered that of sixty-eight animals comprising the herd nine were badly affected. A young bull, a heifer, and three cows had to be destroyed. The four other cows recovered, and reared splendid healthy calves. The matter was in the hands of Mr. C. J. Pound, Government Bacteriologist, and that gentleman successfully freed the whole of the herd from tuberculosis. A year later, we published in this *Journal* the pedigrees of seven of the best pure Ayrshire cows of the herd, and also the yield of milk of each for twelve months. The present cattle are pictures of good breeding, and have taken numerous prizes at the exhibitions of the National Association at Bowen Park.

Lately a splendid Ayrshire bull has been imported from the south for this herd. The accompanying illustrations, lately taken by Mr. W. H. Mobsby, Artist to the Department of Agriculture, give a very good idea of the Ayrshires and the milking-sheds, and of the Ayrshire bull Ardgowan King Fritz, whose pedigree runs as follows:—

Ardgowan King Fritz is not quite four years old, being born on 13th March, 1902.

Bred by Sir W. R. Shaw Stewart, Bart., Ardgowan, Inverkip.

Society's Register Number, 5398, Volume 27, of the Ayrshire Cattle Herd Book, Society of Great Britain and Ireland.

Sire: Duke King of Ardgowan, Register No. 4232.

Sire of sire: Bend Or of Hillhouse, Register No. 4124.

Dam of sire: Pumila of Ardgowan, Register No. 11981.

Dam: Louise of Ardgowan, Register No. 13910.

Sire of dam: Duke of Mauchline, Register No. 2680.

Dam of dam: Lady Love of Ardgowan, Register No. 8085.

STOCK-KEEPING WITHOUT SYSTEM.

The following article, which is applicable in many cases to dairy farmers and other stock-keepers in Queensland, we take from the *Mark Lane Express*. We particularly commend to the notice of farmers the remarks concerning conservation of fodder, to obviate the necessity which is constantly arising in this State for selling stock, because no precautions have been taken to make provision for the dry seasons so frequently experienced in parts of the Southern and Western districts:—

"Impossible would it be to draw any satisfactory causes for the strange anomalies in the county agricultural statistics, the main particulars of the losses and gains of which we gave last week. Side by side we have large districts seemingly similarly circumstanced, and engaged in the like enterprises, yet how different are their returns, some of the counties having the greatest reputation for sheep-breeding decreasing their flocks, while others are increasing them very much. In respect to cattle, the surprises were not so great, but even in regard to these there are strange, unexpected anomalies, about which the only safe deduction to draw from the returns appears to be that the agriculturists belonging to the herds must be actuated by very different systems and principles of management.

"The fact appears to be that an increased number of farmers do not regard systems or the best reputed principles of action very much, but rather proceed on a 'hand-to-mouth policy.' If the farmer before winter finds a shortage of winter food he sells the breeding stock he should have made every effort to keep on, or, if he is not a breeder, refrains from buying, and in either case it may be difficult to replace other animals in spring, so as to bring up the number to the normal stockage before the statistics are taken. While a great many act thus, others act on system, and, by wise provident storages of hay,

silage of straw fodder beforehand, manage to prevent their herds and flocks diminishing beyond a given standard in the worst seasons of food scarcity. If there is a shortage of roots, they are eked out by being pulped, the pulp being intermixed with straw chaff, the ration being brought up to the required nutritive quality by the addition of oil cake, corn, or some other auxiliary feeding stuff.

"This system has been more usually adopted in past times by provident flock-owners and cattle-breeders; but there are some other ways of preparing for emergencies, such as being studiously particular to avoid all waste of food, and to make as large storage of it as possible that the latter may be reserves for the scarcity periods. This is done to a large extent so far as keeping old hay ricks goes; but how few make silage when grass or green crops are plentiful, or grow catch-crops for the special purpose of converting them to silage! The arable land is often allowed to remain fallow for months when it should be growing green crops to serve the object. The late Mr. C. S. Read was strong in his advocacy of the good policy of utilsing such waste products as coarse grass under trees, the trimmings of banks, ditches, lakes, and walks in woods and plantations, all of which are available for silage, although of comparatively poor quality.

"There are many who consider every bit of sweet straw wasted when employed for littering purposes, because it is so much more valuable as a food substance for stock, and, if carefully preserved to serve that object, would be likely to prove invaluable at some future time. But the majority of farmers pay no heed to such things, and no doubt this is the chief cause why the numbers of their live stock vary so very much from one year to another."

On this point Mr. F. Wilson writes in the *Agricultural Gazette*, London, as follows:—

A POINT TO STUDY: WHEN TO SELL.

In the stockbreeder's business, the art of success in the profitable disposal of fat or store stock is to know when to sell—to take advantage of the markets, and obtain as good a return as possible. To have a few fine milch cows or down-calving heifers for sale in early autumn—when the milk flow begins to wane from the spring calvers—and onwards through the winter months is a way to turn money over which should be taken advantage of whenever possible by the stock-raising farmer, who may or may not be a dairyman himself. If he is, he must work upon the principle of "enough and to spare." His own milk-and-butter supply must not be interfered with—he must breed to keep and breed to sell. While advocating the rearing of stock to a high pitch of excellence—poor cattle pay nobody, and least of all their breeder—so that whatever is for disposal may be indisputably good of its kind, and worth, as a natural sequence, the best price going, the policy of parting with the primest animals in the form of stores is not to be recommended. Unless overstocking has to be reckoned with—which will seldom occur if proper foresight is exercised—the pick of the cows and heifers should remain on the farm to do their best for their owner. There is no more unwise plan than to be continually parting with the first-raters, leaving others not so good behind. This is working backwards, and at a loss. The thing to aim at is to have good stock to sell at the right time. The paying period is when supply meets brisk demand. The man who sells haphazardly, or when he happens to have something ready, gets perhaps £12 for a calving heifer which, if offered at the right season, would fetch £19, and the same thing happens to his milch cow; she may bring him £15 or £16, when she might be timed to be worth £22 or £23.

The same rule applies to the pig-breeder who, with a lot of young pigs and stores for disposal during the summer months, complains of prices being so low that he can hardly give the animals away. He takes 12s. or 14s. for a smart little pig of as many weeks old or more, which if bred to meet the market would fetch £1 10s. to £1 15s.

The seller who is always on the grumble—and one is continually meeting him—has usually himself to blame for his "bad luck," as he terms it. Foresight is a thing unknown to him, and past experience apparently teaches him little.

If stock is to be made remunerative, it must be sold for the most money possible. By putting it on the market at the right time, avoiding the periodical seasons of dulness and slackness as far as may be, the turnover can be about doubled.

EXPERIMENTS IN CALF-FEEDING.

Experiments on calf-feeding have just been completed at the Queensland Agricultural College, which should be very interesting to dairymen. The results of the different foods are given below:—

Three calves with Acme Food; half a cupful of the food with the same amount of pollard mixed with 1 quart of boiling water and separated milk added. Food given twice daily, at a temperature of 95 degrees Fahr.

Date.	No. 1, Whitenose (Ayrshire).			No. 2, Snowy (Shorthorn).			No. 3, Roany (Shorthorn).			Total Increase.
	Food Drunk since last Weighing.	Weight.	Increase.	Food Drunk since last Weighing.	Weight.	Increase.	Food Drunk since last Weighing.	Weight.	Increase.	
1905.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
23 Aug. ...	...	132½	...	...	113	...	...	105½	...	...
30 " ...	120	139½	7	120	113½	0½	120	107½	2	9½
2 Sept. ...	58	139½	Nil	58	113	0½	58	111	3½	3
	178	...	7	178	...	Nil	178	...	5½	12½

The calves drank this food greedily, but were scoured, and did not look well. The food being finished on the morning of Saturday, 2nd September, they were put on a mixture of 4 parts separated and 1 part whole milk.

Date.	No. 1, Whitenose (Ayrshire).			No. 2, Snowy (Shorthorn).			No. 3, Roany (Shorthorn).			Total Increase.
	Food Drunk since last Weighing.	Weight.	Increase.	Food Drunk since last Weighing.	Weight.	Increase.	Food Drunk since last Weighing.	Weight.	Increase.	
1905.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
6 Sept. ...	76	146½	7	75	122½	9½	80	122	11	27½
13 " ...	140	158	11½	140	131½	9	140	129	7	27½
20 " ...	140	168	10	140	143½	12	140	140½	11½	33½
27 " ...	140	180	12	140	151½	8	140	153	12½	32½
4 Oct. ...	140	187	7	140	156	4½	140	159	6	17½
11 " ...	140	199½	12½	140	167½	11½	140	171	12	36
	776	...	60	775	...	54½	780	...	60	174½

Valuing separated milk at ¼d. and whole milk at 3d. per 10 lb., the daily cost for each calf is 1·8d., and the increase of weight of same 1·7 lb. per day.

The price of the Acme Food has not yet been obtained.

Three calves fed on Vacuum Oil Co.'s Emulgent and separated milk; commencing with 7 lb. separated milk and ½ oz. of Emulgent, increasing to

10 lb. of separated milk and 1 oz. of Emulgent to each calf for each meal. Two feeds per day.

Date.	No. 1, Red and White (Ayrshire).			No. 2, Nigger (Holstein).			No. 3, Roany (Shorthorn).			Total Increase.
	Amount Drunk since last Weighing.	Weight.	Increase.	Amount Drunk since last Weighing.	Weight.	Increase.	Amount Drunk since last Weighing.	Weight.	Increase.	
1905.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Rb.	Lb.
Aug. 23 ...	...	137½	...	...	125	...	...	93½	...	...
„ 30 ...	120	143	5½	120	132½	7½	120	100½	7	20
Sept. 2 ...	58	150	7	58	140½	8	58	105	4½	19½
„ 6 ...	78	153½	3½	78	142½	2	70	110	5	10½
„ 13 ...	140	165	11½	140	155	12½	133	116	6	30
„ 20 ...	140	171	6	140	161	6	118	125	9	21
„ 27 ...	140	179½	8½	140	172½	11½	140	130½	5½	25½
Oct. 4 ...	140	186½	7	140	178	5½	140	140	9½	22
	816	...	49	816	...	53	779	...	46½	148½

Valuing separated milk at ¼d. per 10 lb., the Emulgent at 6s. per gallon, the daily cost for each calf is 1·3d., and the increase of weight of same per day is 1·2 lb.

Three calves fed on Magic Calf Food prepared according to printed directions, viz.:—"3 measures of the food mixed with water until it is the consistence of cream; pour on 2 quarts boiling water; let it stand covered for 15 minutes; then add separated milk to make up to 2 gallons."

Date.	Holstein.			Ayrshire.			Shorthorn.			Total Increase.	Average Daily Gain.
	Weight.	Difference.	Amount of Food Given.	Weight.	Difference.	Amount of Food Given.	Weight.	Difference.	Amount of Food Given.		
1905.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
10 Oct.	109½	...	...	114	...	...	161½	...	...	...	...
17 „	115	+ 5½	98	115	+ 1	98	159	− 2½	98	4	·19
22 „	120	+ 5	100	124	+ 9	100	172	+ 13	100	27	1·8
	...	+ 10½	198	...	+ 10	198	...	+ 10½	198	31	

The above food being finished, they were put on a mixture of 5 parts separated and 1 part whole milk.

Date.	Holstein.			Ayrshire.			Shorthorn.			Total Increase.	Average Daily Gain.
	Weight.	Difference.	Amount of Food Given.	Weight.	Difference.	Amount of Food Given.	Weight.	Difference.	Amount of Food Given.		
1905.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
24 Oct.	127½	+ 7½	40	125½	+ 1½	40	179	+ 7	40	16	2·6
31 „	135½	+ 8	140	137	+ 11½	140	192	+ 13	140	32½	1·5
7 Nov.	138	+ 2½	120	150	+ 13	120	209	+ 17	120	32½	1·5
14 „	148½	+ 10½	130	152	+ 2	130	212	+ 3	130	15½	
		28½	430		28	430		40	430	...	

The *Magic Food*: The average increase of weight of a calf per day is ·86 lb., and the cost of each calf per day is 2·2d.

The mixture of separated and whole milk: The increase of weight of a calf per day is 1·5 lb., and the cost per day of feeding one calf is 1·45d., when separated milk is valued at ¼d. per 10 lb. and whole milk 3d. per 10 lb.

Three calves fed on separated milk and pollard; the pollard being boiled in separated milk and being in the proportion of 3 oz. to 10 lb. They were fed

twice daily 7 lb. per calf per meal the first week, and 10 lb. the second and other weeks. Temperature of food, between 90 degrees and 100 degrees Fahr.

Date.	Holstein.			Guernsey.			Shorthorn.			Total Increase.	Average Daily Gain.
	Weight.	Difference.	Amount of Food Given.	Weight.	Difference.	Amount of Food Given.	Weight	Difference.	Amount of Food Given.		
1905.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Oct. 10	116	...	...	121½	...	...	140½	...	...	...	...
„ 17	124	+ 8	98	131½	+ 10	98	145	+ 4½	98	22½	1·1
„ 22	133	+ 9	100	140	+ 8½	100	157½	+ 12½	100	30	2·0
„ 24	139	+ 6	40	144½	+ 4½	40	155½	− 2	30	8½	1·4
„ 31	148½	+ 9½	120	159½	+ 15	140	171	+ 15½	120	40	1·9
Nov. 7	156	+ 7½	110	163½	+ 4	120	177	+ 6	100	17½	·78
„ 14	166	+ 10	130	168	+ 4½	130	182	+ 5	130	19½	·93
		+ 50	598	1,028½	+ 46½	628		+ 41½	578	138	1·3

The cost of the above for 1 calf per day is ·43d., and the increase of weight for 1 calf in a day is 1·3 lb.; separated milk costing ¼d. per 10 lb., pollard costing £4 per ton.

TESTS IN PORK PRODUCTION.

Corn must ever be the basis of all pork production, but by the experiments carried on at several experiment stations it has been proved that there are other grains that can profitably be used as a supplement to the corn ration. As to protein and mineral matter, there are other grains and many by-products that are better than corn. When these are combined with corn, they make a more complete and more economical and efficient ration than the corn alone. Among these by-products which are good for pig feed are middlings and the dairy products such as skim milk, buttermilk, &c., and recently the by-products from the packing-houses that have come into use, and a considerable number of swine-growers use soy beans, cowpeas, and other leguminous crops, according to Professor J. H. Skinner, of Purdue University in a bulletin just issued.

Aiming to point out the deficiency of corn as a sole ration for hogs while growing, and to gather information as to the feeds that could be most profitably used with corn, the Indiana station carried out a test in 1904.

Sixteen crossbred pigs, bred on the university farm, were divided into four lots of four pigs each. Their dams were purebred Yorkshires, and their sire a purebred Poland-China. The pigs were all vigorous and thrifty, and averaged about 55½ lb. each. The various lots were equally divided as to sex, and averaged the same as to weight.

The pigs were fed twice daily, the feeds being weighed dry, and then mixed with water enough to make a thick slop. The amount of feed was governed by the appetite of the pigs in each lot, they being fed all they would properly clean up. They had the run of a dry lot, and had charcoal and salt before them. They were weighed once a week at regular intervals, individual weights being kept. The experiment began 27th February and ended 21st May, a period of twelve weeks.

The feeds used were as follows:—Cornmeal, a medium coarse article, at $18 (£3 15s.) per ton; middlings, of good quality, at $22 (£4 11s. 8d.) per ton; soy beans, at $33 (£6 17s. 6d.) per ton; digester tankage, from Swift and Co., at $33 £6 17s. 6d.) per ton. The prices upon corn, middlings, and tankage represent the actual cost of the feeds used. The price of soy beans was placed at $1 (4s. 2d.) per bushel, which gave a decided profit over the cost of production.

The feeds were given in the following proportions by weight:—Lot 1, cornmeal alone; nutritive ratio, 1 : 13·3. Lot 2, one-half cornmeal, one-half

wheat middlings; nutritive ratio, 1:8. Lot 3, two-thirds cornmeal, one-third soy beanmeal; nutritive ratio, 1:5·1. Lot 4, five-sixths cornmeal, one-sixth tankage; nutritive ratio, 1:5·2.

Lot 1, receiving cornmeal, only gained a total of 183 lb. during the twelve weeks. The average daily gain was 55 lb. Lot 2 gained 365 lb., and made an average daily gain of 1·09 lb. per head. Lot 3 gained 4·02 lb., with an average gain of 1·2 lb. per head. Lot 4 gained 348·5 lb., and made an average daily gain of 1·04 lb. The use of middlings increased the gains 100 per cent., soy bean meal 120 per cent., and tankage increased the gain 90 per cent. over a ration of corn alone.

The amount of feed required per 100 lb. gained in Lot 1 averaged 557·1; Lot 2, 343·4; Lot 3, 310·6; and Lot 4, 330·6 lb. Lot 1 made the largest gains during the first week, and each of the other lots made the largest gains during the last week. The gains made by the pigs fed cornmeal alone were not satisfactory, as they were too small to be profitable, although the pigs had all they could consume and good care.

The cost of producing 100 lb. of gain was \$5·01 (£1 0s. 10d.) where the corn alone was fed, and it required 557·1 lb. per 100 lb. gain. Lot 2 cost \$3·44 (14s. 4d.) per 100 lb. gain, Lot 3 cost \$3·59 (14s. 11½d.), and Lot 4 cost \$3·71 (15s. 5½d.) per 100 lb. gain.

The following table gives the summary of feeds consumed and gains made by the different lots:—

—	Lot 1—Cornmeal.	Lot 2—One-half Cornmeal, one-half Middlings.	Lot 3—Two-thirds Cornmeal, one-third Soy Beans.	Lot 4—Five-sixths Cornmeal, one-sixth Tankage.
	Lb.	Lb.	Lb.	Lb.
Total feed consumed ...	1,019·5	1253·5	1,249·875	1,262·25
Total gain	183·0	365·0	402·0	348·5
Daily gain ...	2·18	4·35	4·78	4·15
Daily gain per head ...	·545	1·087	1·195	1·038
Feed per 100 lb. gain ...	557·1	343·4	310·6	330·6

The following table is a financial statement of the experiment:—

—	Lot 1—Cornmeal.	Lot 2—One-half Cornmeal, one-half Middlings.	Lot 3—Two-thirds Cornmeal, one-third Soy Beans.	Lot 4—Five-sixths Cornmeal, one-sixth Tankage.
Total gains	183 lb.	365 lb.	402 lb.	348·5 lb.
	\$ £ s. d.	\$ £ s. d.	\$ £ s. d.	\$ £ s. d.
Costs of grain	9·18=1 18 3	12·54=2 11 3	14·44=3 0 2	12·94=2 13 11
Value of grain at \$5 (£1 0s. 10d.) per 100 lb.	9·15=1 18 1½	18·25=3 16 0½	20·10=4 3 9	17·43=3 12 7½
Profit	0·03= ·015	5·71=1 3 9½	5·66–1 3 7	4·49=0 18 8½
Cost per 100 lb. grain ...	5·01=1 0 10	3·44=0 14 4	3·59=0 14 11½	3·71=0 15 5½

Corn alone is not a profitable feed for growing and fattening swine, and swine-growers would do well to investigate the merits of soy beans. They can be very easily grown, and will furnish a home-grown supply of protein in a very desirable form. A yield of 20 bushels per acre means approximately 360 lb. of digestible protein, while 20 bushels of wheat to the acre would yield 120 lb. of digestible protein.

The pigs in Lot 1 soon after they were placed on the cornmeal diet seemed to lose their appetite, and did not eat with as keen a relish, and required constant changes in the quantity of the ration to keep them on feed. Lot 2 evidenced no lack of appetite, but as the experiment progressed their appetites did not have such a keen edge. Lots 3 and 4 did not seem to relish the soy beans and tankage ration at first, but in a few days became accustomed to it, and ate it greedily until the close.—*Chicago Drovers' Journal.*

Poultry.

HINTS TO BREEDERS OF POULTRY FOR EXPORT.

As announced, the Department of Agriculture and Stock are prepared to receive, during December, January, and February, chickens and ducklings for export to London. Intending shippers should notify the Under Secretary at once of their desire to ship poultry, stating the probable number.

To enable small growers to avail themselves of the opportunity to ship, the Department have altered the minimum number to be received to twelve chickens or six ducklings.

This should enable anyone to send an even lot of birds. Shippers should try to send as many as possible of the same weight and condition, and should regulate their consignments so that their birds can be packed separately. Odd numbers should not be sent in. This will greatly help the Department in furnishing individual returns.

The requirements of the London people should be carefully studied. White-fleshed, plump chickens are wanted, and light-coloured legs are preferred. Black-legged fowls are not popular. For instance, Buff Orpington and Wyandotte chickens weighing 4½ to 5 lb. we received 3s. 6d. each in London, whilst for Black Orpington, 4 to 4½ lb. in weight, 2s. 6d. to 3s. each, the flesh in both varieties being white and only differed in leg colour.

Cream or yellow legs may be sent, provided that other qualities—viz., weight and plumpness—are shown.

Birds must be plump and young, not over five months, and not under 3½ lb. live weight.

It does not follow that if a 3½-lb. bird is sent in it will be exported; the breast must be full of meat. In many cases birds are sent in with a razor-like breast, and the bulk of the weight in legs and bone, &c.

Grade birds carefully before they leave the farm. Do not spoil a lot by putting in an inferior bird. It is to the interest of growers that only the best should be sent. The prices quoted above clearly show that a good quality of bird will be well paid for.

The cost of handling, freight, and charges is just the same on second-grade as on first; so, if the best returns are expected, comply with the printed conditions.

Do not try and "best" the grader in the matter of age, &c. Should you by any chance pass *him*, you have still to pass a rigid examination by London buyers, and the loss will be yours, not only on the inferior bird, *but on the whole case.*

The favourable comments passed by London salesmen on our first quality of chickens is encouraging, they being classed as superior to Russian or American chickens, and, if the quality be maintained, a very good trade can be worked up, as the demand at the time of year mentioned above is almost unlimited for first-rate quality.

Birds should be penned either in crates or small runs for from fourteen to twenty-one days (according to condition) before shipping. This will increase the weight and quality of the birds. Crate fattening, if it can be carried out, will prove the better plan; failing that, the small pen; birds to be fed on crushed grains, mill offals, malt sprouts, and boiled potatoes, fed in a soft state; green food and grit to be given. Separated milk is a good flesh-former. Mix the mash with it, or with milk in any form; thus both the quality and quantity of flesh will be improved, and also the colour and texture.

In the case of ducklings, the same general rules as to grading to size and quality must be observed.

Particular attention must be given to fattening. Ducklings will not be exported if not of plump breast and carrying plenty of meat. Intending shippers should note that, unless the birds are penned, they cannot expect to get condition on. Ducklings picked straight off the run are not likely to pass the grader.

Ducklings were very disappointing in our last shipment, no first-grade birds being forwarded. Breeders have now plenty of time to top up their birds if they are sent in at any time during December, January, and February, and if found up to standard they will be exported.

Good prices are obtainable in London in season for good quality. They will be packed in boxes containing six, to ensure evenness of quality.

Particular attention is directed to weight and age conditions.

Kindly notify the Department at your earliest convenience. Do not leave it to the last moment.

FOODS AFFECTING FLAVOUR OF EGGS.

An experiment was conducted by the North Carolina Experiment Station to determine the effects of food fed to the hen upon the flavour of her egg, and the results are startling. Chopped wild onions—bulbs and tops—were given in mash to the hens. At the beginning of the trial ½-oz. per head was fed daily to the hens of different breeds, but no noticeable flavour of onions could be detected until the fifteenth day, when a slight "onion" flavour was perceptible. Then the amount of onions fed was doubled for four days and afterwards discontinued. The eggs laid during these four days savoured so strongly of onions that they could not be eaten, but the flavour became less noticeable day by day after the feeding of onions had been stopped until a week had elapsed, when no foreign flavour was noticeable.

It would seem, therefore, that flavour can be readily imparted to eggs by feeding, but that different foods which are not so strongly flavoured as onions might probably be fed without imparting any distinct flavour to the eggs.

We must also consider the influences which surroundings may have on the egg after it has been deposited in the nest. That it may be detrimentally affected there is no room for doubt. First of all, the nest may injure the egg. Nests should therefore always be made of some sound, sweet-smelling material, such as dry oaten straw, and in no circumstances should damp, dirty, or musty materials be used in the construction of the nest; for if the eggs are allowed to remain even but a very short time in such a nest they will acquire a flavour that may not be relished by every palate.

It is also necessary to collect the eggs off the nests two or three times a day, especially if the weather is warm, or if there are many broody hens about the place. On many farms the eggs are not regularly collected, and sometimes they remain in the nests for two or three days. It frequently happens that eggs are not very old and yet they are "off flavour," because they have been allowed to remain longer than necessary in a musty nest, and many of the stale, musty, and half-decayed eggs which are found in the markets may have their bad quality traced to this cause.

Next in importance to the nature of the nest and to the regular collection of the eggs is the matter of keeping eggs between the time of their collection and despatch to market. If they cannot be sent to market direct from the nest, which is the best system possible, they ought to be stored in the coolest available place, and particular care should be taken that they do not come in contact with any liquid or substance which gives off a strong odour, as, for instance, petroleum or onions, as the shell of an egg is porous, and its contents are easily contaminated.

The Orchard.

PREVENTING DECAY OF RIPE FRUIT.

The *Agricultural News*, Barbados, takes the following from an article in the *Journal of the Board of Agriculture* (London, August, 1905), entitled "A Method of Preventing the Rapid Decay of Ripe Fruit," which is of particular interest to growers of tropical fruits:—

A careful examination of ripe fruit from the West Indies, intended for exhibition at the Crystal Palace in connection with the Colonial Exhibition, showed very clearly that the decay of such fruit as mangoes during the voyage was due entirely to mouldiness and fermentation set up by fungi and bacteria that were present on the surface of the fruit before shipment, and not to an inherent tendency on the part of the fruit to decay or to become over-ripe.

It is common knowledge that the decay of ripe fruit originates from bruises or wounds on the surface, and thence rapidly spreads both internally and over the surface. Unfortunately, it is not so generally known, although equally true, that the decay of the bruised or wounded part is entirely due to the presence of the germs of fungi or bacteria, which develop rapidly, feeding on the sugar or other substances liberated from the bruised tissue. Fermentation and decay follow, and quickly spread from one fruit to another.

Similar treatment might be applied with advantage to certain tropical fruits that do reach us in fairly good condition, as bananas, where too frequently the unsightly and injurious blackened "skin," caused by an external fungus, could be easily prevented. Apples, pears, oranges, lemons, &c., would also repay similar treatment.

The method of treatment described below is very simple, inexpensive, and perfectly free from danger.

In the case of fruits where every part is eaten, as strawberries, &c., the fruit should be immersed for ten minutes in cold water containing 3 per cent. of commercial formalin (equal to 40 per cent. of formaldehyde). On removal, immerse the fruit for five minutes in cold water, and afterwards place it on wire-netting or some similarly open material to drain and dry.

When the fruit has a rind or "skin" that is not eaten, the immersion in water after treatment in the formalin solution can be omitted with advantage.

The rotting or fermentation of ripe fruit was proved by Pasteur to be due to the presence of living organisms—fungi and bacteria—on the surface.

From this starting-point it was inferred that, if these organisms could be destroyed, the period during which such fruit could be kept in a perfect condition could be considerably prolonged; and a series of experiments conducted in the Jodrell Laboratory at Kew proved the inference to be correct.

The fruits experimented upon were ripe cherries, gooseberries, grapes, pears, and strawberries. The fruit was not selected, but purchased from shops or, in some instances, from vendors in the street.

This fact suggests that the method of fruit preservation described here, although valuable in extending the duration of home-grown fruit in good condition, will eventually prove to be of the greatest importance in enabling our markets to be stocked with many delicious kinds of tropical fruit, which under present conditions never reach us.

Apiculture.

ADVICE TO BEGINNERS IN BEEKEEPING.

The keeping of bees, both for pleasure and profit, is, happily, much more frequent now than thirty years ago, when the advent of cheap sugar had nearly driven from the country markets the coarse honey gathered by the old straw skep system. This increase of beekeeping has been brought about by the perfecting of the modern frame hive, which enables the home of the bee to be laid open to view, and provides means whereby the stores can be taken, fit for immediate use, without injury to the bees or their owner.

For any one desirous of becoming a beekeeper, the first step is to get a book on apiculture and study it. There are many now from which to choose. As a personal explanation of the terms used and of the outfit required is a great help, an interview should, if possible, be obtained with an experienced beekeeper. The appliances required are:—Black net veil; smoker, for subduing bees; wax comb foundation (brood and super); bottle-feeder; section boxes; frame hive, fitted with brood foundation in ten or twelve standard frames, two division boards, section-rack or lift of shallow frames, a queen excluder, and quilts. If the hive is to be worked for extracted honey, a centrifugal honey extractor, will also be needed. Additional useful articles are:—Scraper-knife, for cleaning floorboards, frames, &c.; comb-uncapping knife, for use when extracting; a straw skep, for taking swarms; spare coverings of felt or carpet; a super-clearer, for clearing bees from section racks or supers.

There are many patterns of hives, all made to take the one British standard frame. A simple one should be chosen, possessing accuracy of workmanship and soundness of material, so as to stand exposure to the weather for years. The outside of the hive should be thoroughly painted, to keep it rain and damp proof. It must be placed on its stand in a spot sheltered, if possible, from the cold south and west winds, and with a free flight for the bees in front. Space should be left behind it for easy access, then all manipulations can be carried on from the back; this avoids irritating the home-coming bees.

The swarm should be ordered either from a recognised dealer or from a neighbouring beekeeper. The only safe way for a beginner to start is with a "head" or first swarm. By this means he will avoid all the pitfalls of disease or lack of condition, which only a practised eye can detect, but which beset the purchaser of secondhand stocks. Given a good season, a swarm should be able to establish itself, and provide some surplus for its owner, in its first year.

When the box or skep containing the swarm arrives, it must be placed in the shade near the hive the bees are to occupy. The screws of the lid of the box should be taken out; or in the case of a skep the cording and wraps should be removed, and in the latter case the skep should be placed on a board, with a fair-sized stone under its edge, to allow of ventilation. The bees will soon quiet down, and cluster, after the shaking up of their journey, and thus will be in a condition for handling easily. In the early evening the hive must be prepared to receive them. The shallow frame lift or section-super should be taken away, leaving only a thin quilt over the frames, which have already been fitted with brood foundation. Then the front of the hive must be raised from the floor board about an inch, by means of two wedges. Next, a board, the width of the hive, is placed in front of, and level with, the alighting board sloping down to the ground. This temporary board and the alighting board are covered with a cloth hanging over the sides to the ground, to prevent bees from crawling underneath. Then the skept or box is taken between the palms of the hands and carried mouth downwards until it is just above the sloping board. With a smart jerk, the bees are thrown out in front of the hive, and they will at once begin to take possession of their new home. As they run in, watch should be kept for the queen. It is a satisfaction to see her safely enter her abode. When all are in, the wedges should be taken away, and the front of the hive lowered to its proper place. Crushing of any of the bees must be

avoided. Any that are in danger may be cleared away with a feather. If the swarm has been a long time on its journey, or if the weather is bad on its arrival, the bees will be greatly benefited by being supplied with half a pint of warm, thin syrup, through an opening in the quilt, and by means of the bottle-feeder. On the second day after hiving, the quilts should be turned back from the ends of the frames to ascertain if the "foundation" remains properly fixed, and to see if the work is going forward well. If this is the case, the quilt may be taken off and the queen-excluder put on in its place. Over this a lift of shallow frames should then be placed and covered warmly with a quilt and carpets. The stock may now be left alone till the end of the honey season. More skill is required for obtaining comb honey in sections in good condition, but the section rack may be used instead of the shallow frames, if desired.

It is important that the beginner should clearly understand the principles that underlie successful beekeeping. A colony of bees consists of a queen, a large number of worker bees, and (during summer) a certain proportion of drones. The strength of a healthy stock depends on the vigour and laying power of the queen, who is at her best in her second season—*i.e.*, a queen hatched in June, 1904, is at her best in May, 1905, and should be replaced by a young one in 1906, either by natural swarming or by requeening. Queens may be purchased, or raised by the methods taught in textbooks. The economy of a hive consists—first, on the keeping up of the warmth of the brood nest (by means of the heat evolved from the bodies of the clustering bees) to such a point as will stimulate the queen to lay eggs, and will enable young bees to be reared; secondly, on the feeding of the queen, and the nursing of the brood, and cleansing the cells for the queen's use; thirdly, on the obtaining of pollen, water, and nectar for the brood; lastly, on the building of storage combs and collecting nectar for the future supplies of honey.

The first three of these conditions must be fulfilled before the last can be begun; therefore, it is only by means of a large and vigorous surplus population that a stock can gather enough stores for its future use, and provide also for the beekeeper. It is obvious that the aim of the beekeeper is to keep his stocks strong, for a weak stock is always unprofitable.

The next consideration is that the crowded condition of the hive should be secured at the right time—*i.e.*, at the honey-flow. Honey is the concentrated nectar of flowers. Spring and early summer are the times when the land is gay with a wealth of blossom, and the honey crop is gathered. Late summer and autumn are times of seed and fruit, and only a gleaning of nectar from wild flowers then remains. There is a period every year, varying in each district, according to soil and altitude, when the supply of nectar is most abundant. This time should be ascertained by the beekeeper, who will then stimulate his stocks beforehand, so that they may have their largest population ready to gather the produce of the various flowers.

Diseases are best guarded against by having dry, weather-tight hives and vigorous queens, and by giving suitable food when feeding is requisite.

The following are the chief maladies to be apprehended:—Dysentery, a disease of adult bees, is caused by undue winter confinement, unsuitable food, and damp hives; chilled brood and paralysis are caused by sudden frost in late spring, or by untimely manipulation; bee pest or foul brood is a terribly infectious disease, endemic in many places in England.

A word of warning and encouragement on one other point must be given. No one can keep bees without being stung. The sting of the bee is painful but harmless (except in rare instances), and in time, after many stings, the effect is so slight as to be quite disregarded. It is advisable to wear a veil to protect the face and head, but the hands should be left bare. Their best protection is the gentle, careful manipulation of the bees while attending to them. The foregoing is written for those who propose to keep a few stocks of bees. Anyone intending to keep a large number of stocks is advised to get a season's instruction in a well-managed apiary before laying out capital in the business.—*Journal of the Board of Agriculture.*

Tropical Industries.

QUEENSLAND COTTON.

Last year, in response to the invitation to the farmers extended by the Minister for Agriculture, to take advantage of the opportunity afforded them in consequence of the short crop of cotton in the United States of America and the consequent enhanced price of the textile, about 100 farmers in the Southern district planted seed imported by the Department of Agriculture. The work was largely experimental, but its results were highly gratifying and very remunerative to those who took the trouble to carefully cultivate the crop. It has been conclusively proved that cotton can be grown to a profit under existing labour conditions, and, considering the cash results to the farmers, it is surprising that many more have not taken up cotton cultivation this season. The returns for last season show that cotton grown as an adjunct to other farm crops is well worthy of attention. The yields last season would have been considerably higher if the cotton had been put in earlier. A further disadvantage was the damage done to the plants in some places by a plague of grasshoppers. Then, again, some farmers ignored the instructions given by the Department's cotton expert as to the distance apart of the plants. Cotton plants 5 feet apart cannot be expected to give as good results as those planted 4 feet by 1 foot 6 inches apart, as their tendency is to run to wood at the expense of fibre. In rich soils it is better to leave two plants together. The proper time to plant is September, but that planted so late as December did fairly well.

As a result of last season's planting show that no grower received less than £5 per acre for his seed cotton, whilst some got as much as £16 per acre.

In the Lockyer and Fassifern districts the following are some of the results:—

	Acres.	Gross Return.		Per Acre.
No. 1	3¼	£38 12 4	=	11 17 7
2	3½	20 9 0	=	5 16 10
3	3½	53 1 7	=	15 3 3
4	4	22 16 2	=	5 14 0½
5	5½	42 2 4	=	7 13 1
6	4	36 12 3	=	9 3 0¾
7	1¾	14 15 2	=	8 8 8
8	2	20 13 5	=	10 6 8½
9	2	18 6 1	=	9 3 0½
10	1¼	14 0 6	=	11 4 5

Five acres near Brigalow, Dalby district, £12 11s. 3d.; the small result was due to continued dry weather.

The general average amounts in round numbers to £9 9s. per acre.

The total expenses of producing 1,000 lb. of seed cotton on 1 acre are shown to amount, from sowing to marketing, to £3 6s. 4d. This includes £2 1s. 8d. for picking. Assuming that only the farmer and his family have picked the crop, the cost of picking as a cash outlay need not be considered, so that a crop which sells for £9 9s. is secured at a cost of £1 4s. 8d., leaving a net profit of £8 4s. 4d. per acre. Adding the cost of picking as a cash outlay, the net profit is yet £6 2s. 8d. per acre. This is quite irrespective of the value of the seed, which to-day is worth £5 6s. 3d. per ton, or £1 13s. 2¼d. per acre. Under such conditions, it would seem that cotton will well pay to grow and sell at 1½d., or, as in the cases here mentioned, 1⅘d. per lb.

Should the latest invented cotton-picking machine come up to expectations, we might yet see large cotton plantations worked to a profit in Queensland. Should all accounts of this machine received so far be correct, then the question

of labour for picking will be at once set at rest. This new machine is said to be able to harvest 20 acres a day, only four men being needed to work it. It is further stated that, whereas previous machines were unable to gather in only the ripe cotton, but took in even unopened bolls, this one will operate only on the fully matured bolls, and the cost of picking will be reduced to something like 2s. per acre.

QUEENSLAND COTTON IN ENGLAND.

A short time ago, Mr. D. Jones, of the Agricultural Department, sent some samples of Upland cotton to a cotton-spinner at Oldham, who, to confirm his opinion on the samples, submitted them to the British Cotton-growing Association, the chairman of which body was good enough to give his estimate of their value and his criticisms on them. This report emphasises Mr. Jones's contention that our cotton is too varied in staple to suit the English trade.

The Department of Agriculture when importing seed stipulated that the varieties were to be certified to by an American expert as being absolutely pure and unmixed. No more than this could be done unless the expense of a specially qualified agent sent from Queensland to make the purchases had been incurred.

Assuming that the seed was what it purported to be, then the unevenness in staple can only be accounted for by the growers mixing the various varieties when picking or even mixing the seeds at sowing time. It cannot be too strongly impressed upon cotton-growers that each variety should be kept absolutely separate if we are to find a good market in England or elsewhere. An even staple ensures a good price, whilst the lowest price only can be expected from a mixed sample. We direct particular attention to the reports on No. 1 and No. 4 samples, as emphasising this important point.

"Report of the British Cotton-growers' Association on Cotton Samples from Queensland, 28th July, 1905.

"Sample un-numbered.—Very bright, white, and perfect preparation. Short in staple, and rough, but suitable for mixture with wool. Probably worth to-day 6d. per lb.

"No. 1.—Very imperfect in preparation, which renders it most difficult of sale, and therefore most difficult to place reliable value on. Very irregular in length; probably grown from mixed or Peeler seed. Worth about 5d.

"No. 5.—Brown in colour, probably grown from Egyptian seed. Shorter in staple than Upper Egyptian. Very clean, and free from waste. Worth about 5¾d.

"No. 2.—Good staple, fully 1⅛ inches long, fairly silky, equal to good middling Texas or Orleans. Value, about 6½d. This is a most useful style of cotton.

"No. 3.—About good middling in grade. Rather coarse in fibre, and about 1 inch in length. Worth about price of fully middling Uplands. Value, about 6⅛d. to 6¼d.

"No. 4.—Owing to mixture of seed, both long and short staple *mixed in planting or picking. Impossible to value it.* The small black seed, which apparently is from Sea Island cotton, gives best results.

"Value of Mid-Upland cotton to-day (28th July, 1905), 1-inch staple, 6d. per lb.

"Value of Mid-Texas or Orleans, 1⅛-inch staple, 6¼d.

"(Signed) John E. Newton,
"Chairman of Council."

COTTON-PICKING MACHINE.

The *Home and Colonial Mail* gives the following general description of Mr. G. A. Lowry's latest invention of a machine for picking cotton. Should the reports concerning the performances of the machine be correct, and we have no reason to doubt them, then a great revolution must take place in the cotton-growing industry. The cost of picking the American cotton crop at present amounts to £20,000,000, and it is claimed that by the use of Mr. Lowry's cotton-picker that cost will be reduced to £5,000,000. This means that many thousands of acres will be placed under cotton in addition to the present area. It also points to the possibility of large cotton plantations being established in Queensland, and, most important of all, the price of cotton will be considerably reduced. This, however, would not seriously affect the profits of the grower, because whereas hand-pickers rarely average 100 lb. a day throughout the picking season, each man on the automatic picker can gather in 500 lb. per day. Thus with a machine carrying four operators and one motorman, 2,000 lb. of cotton, or, say, the produce of 2 acres, could be harvested daily. We hear as yet nothing about the cost of the machine, which will probably be considerable, and it does not strike us as at all likely to be used by small growers, nor even by a combination of growers in a district on the co-operative principle, because, as soon as the cotton bolls have burst, the cotton must be gathered in, and all or most of the fields in a district would require the services of the machine at the same time, and, if the cotton were to be left on the bushes for two or three days awaiting its arrival, serious loss would be sustained by the grower.

The report alluded to says:—

The reports received from America of the new automatic cotton-picker go to show that a practical solution of the cotton-picking difficulty has been arrived at. A Mr. Lowry has invented a machine which has excited the greatest interest in the cotton-growing regions. It has been subjected to some exhaustive tests under the supervision of Mr. R. H. Allen, of Memphis, who was appointed to investigate its work, and it appears to have justified its claims. It is a motor-driven vehicle, fitted with eight arms of aluminium, delicately balanced, so that they can be moved in all directions. These arms are fitted with endless belts, covered with wire hooks, and to each pair of arms a man or boy attends. The machine passes down the rows of cotton plants, and the operators direct the arms to the opened bolls; the wire hooks seize the lint, and pass it along to a brush, which gathers it up and collects it in a receptacle. The process of picking by hand is done with much effort by the negroes, who pull off the lint with their fingers, and place it in a bag suspended from the shoulders. The operators sitting on this motor-frame merely point the arms under their control to the lint, and, if only a few of the fibres are seized, the whole of the lint is drawn away to the brush.

The report of Mr. Allen on this machine is certainly favourable. Tests conducted with a machine having only four arms showed that the two lads who operated it got results equal to a pick of over 500 lb. of cotton per man per day. Their capacity as hand-pickers in similar cotton would have been about 65 lb. per day; but the work was not merely greater—it was better done, there was less "trash," such as sticks and dirt in the cotton, and its quality was several degrees higher than that picked by hand in the same field. If the machine can be improved still further and made really serviceable, it will certainly work a revolution in the conditions of the industry, which is already restricted, owing to the scarcity of labour at the busy time of harvest.

MARKET FOR CAPSICUMS AND CHILLIES.

We learn from the *Agricultural News*, Barbados, that there is considerable inquiry for red chillies and yellow Nepaul peppers in bulk in London. As chillies and capsicums grow like weeds in Queensland, and bear very heavy

crops almost all the year round, there should be no difficulty in supplying the British market with large quantities.

A shipment of peppers from the Nevis Experiment Station, recently forwarded to London by the Imperial Commissioner of Agriculture, has been disposed of at very good prices.

The consignment consisted of 64 lb. net weight of yellow Nepaul peppers and 53 lb. of ordinary red chillies.

The former realised the very high price of £2 11s. per cwt. This, however, is not, according to the brokers' report, to be attributed to their intrinsic value, but to their being in a very small lot, and to competition between two bidders who particularly wanted them. "We should not think it safe to expect more than £1 10s. per cwt. for any quantity."

The red chillies realised £1 6s. per cwt. These were reported slightly mouldy, and would appear not to have been properly dried before shipment.

Zanzibar chillies are quoted in the London *Grocer* at £1 17s. per cwt. Small capsicums are in good demand.

RUBBER INDUSTRY IN PARA.

The Consular Report on the trade of Para for 1903-4 has the following interesting note on the rubber industry. The consul deals especially with the alleged adulteration of Para rubber:—

The immediate future of the Brazilian rubber industry is exceedingly encouraging, so much so that a period of general commercial prosperity seems to be assured for several years to come.

The director of the local botanic gardens reports in the "Bulletin of the Para Museum," dated December, 1904, but published in May, 1905, that it has been recently discovered by a person unconnected with the production of rubber that a latex obtained from a tree entirely different from the Heveas has been employed not only to adulterate rubber, but even in some cases to replace it altogether. Experienced estate-owners believe the substitute to be slightly less elastic than the genuine article. It seems that the great demand has led to the practice for some years past. The trees in question are plentiful and exist over a very wide area, and are known in the State of Amazonas by the name of "Tapuru," and in the neighbourhood of Para as "Murupita," "Seringa-Rana," &c. Botanists are of opinion that these trees belong to a species of *Sapium*.

The word "Tapuru" is the Indian name for an insect, and is given to the trees because they are frequently destroyed by termites, particularly when tapping has been performed by unskilful hands. The advantages of the "Tapuru" and its congeners consist in their being more plentiful than the "Heveas" and in their more rapid reproduction.

Dr. Huber, the author of the report referred to, questions if the practice, which he says has passed unnoticed for twenty years, can be described as fraudulent. He considers that, if the union makes no difference to the manufacturer, then no harm is done; and, on the other hand, the knowledge is gained that the sources of supply are greater than was formerly known.

Exporters state that the adulteration is detected by manufacturers by means of chemical analysis, and that the cutters here can detect the presence of an adulterant by the œdematous nature of the product, which leaves an impression when a finger-nail is pressed into it. They describe the blend as "bastard rubber," and classify it with coarse grades. It is possible, however, that the mixture, up to a certain point, may defy detection.

On this subject the *Agricultural News* of Barbados writes:—

A New Source of Rubber.

What appears to be a discovery of considerable importance and one which may have far-reaching effects on the rubber industry has been made known by the publication of a report by Dr. Huber, of the Para State Museum, on Para rubber.

From further information published in the *India Rubber World* it would appear that probably the market has received very little pure Hevea rubber, the product known as Para rubber being a blend of the latices of *Hevea brasiliensis* and a *Sapium* resulting from indiscriminate tapping. This new rubber-tree has been identified as *Sapium aucuparium;* it belongs to the natural order Euphorbiaceæ, of which *Hevea* is also a genus, though widely separated. It is said to be rather a hardy tree, and to grow with great rapidity. Further, its seeds are much less delicate than those of *Hevea.* The tree is very abundant in the Amazon valley.

Apparently the product of this tree has only in a few instances been marketed alone, and very little can be said definitely of its value. It is, however, certain "that there is produced from the latex of *Sapium aucuparium* a rubber which finds ready sale, and which, when mixed with *Hevea* latex, produces a rubber not to be distinguished from the supposed pure *Hevea* rubber."

SISAL FIBRE SCUTCHING.

Some time ago the Department of Agriculture, as our readers were informed, imported a Raspador or Sisal fibre-scutching machine, with a view to treating the sisal leaves at St. Helena. The machine is not intended nor is it of sufficient capacity to deal with large areas, but is quite able to deal with the produce of small plantations. In Mexico, where the workmen are thoroughly up to running these small machines, about 250 to 300 lb. of fibre are turned out daily. Here the workman who runs the machine can run through about two leaves a minute, but with continued practice this quantity could possibly be doubled. Only two men, or a man and a boy, are needed to work it—in fact, it is quite possible for one man to run it, provided a supply of leaves is kept up, and an oil engine requiring little or no attention be used as the motive power. The leaves pass quickly through the machine, and nothing is left but a beautiful white, lustrous fibre, which is dried for three or four hours in the sun, then hung up in the shade for twenty-four hours to become thoroughly dry, when it is ready for baling and shipment.

Our illustrations show the machine at work, and also a portion of the field being harvested. The over-mature leaves from the plants showing the flower-poles were first put through, and in spite of their toughness presented no difficulty whatever in scutching, and yielded a white, lustrous fibre. The plants which are here shown as flowering will produce no more leaves, and will die off this season.

SOWING TOBACCO BEDS.

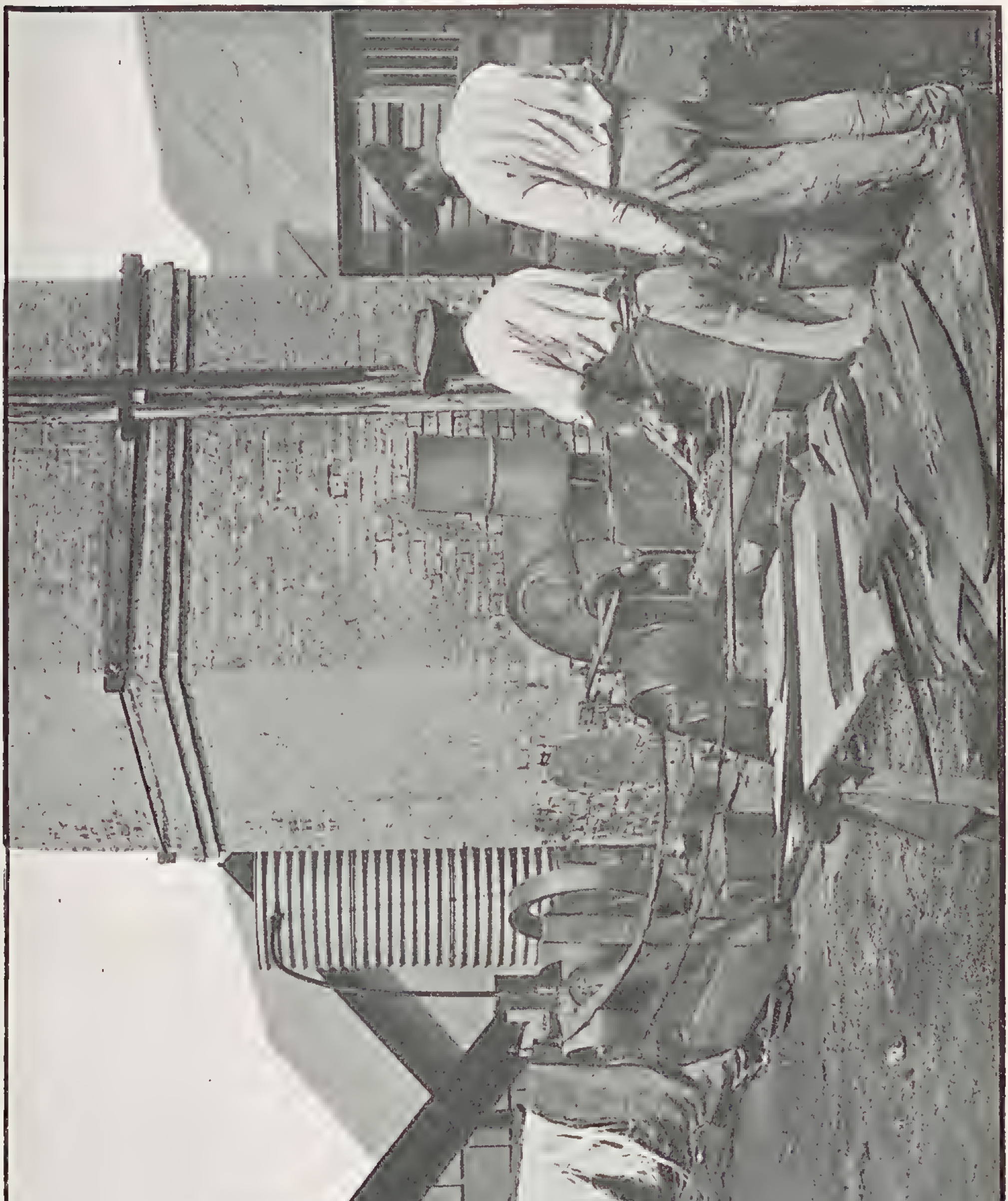
By R. S. NEVILL.

Tobacco seed may be sown in the Maryborough district and north of there up to 25th December in order to get a crop. At this time of year it is necessary to be very careful with the beds, as the hot sun will kill the seeds as soon as they sprout if they are not well protected, and, in fact, they will not germinate at all if great care is not taken. It is always best to put a lot of rubbish on the ground intended to be sown, and burn it; this kills the weed seeds, and saves the trouble of weeding later on, and the ashes are the very best fertiliser that can be had for the young plants. The soil should be broken up to the depth of 6 inches, and made as fine as it is possible to make it, and then mix the seed with ashes and sown thinly. Do not cover or rake in the seed, but take a watering-pot and sprinkle the bed well, going over the bed two or three times, until it is thoroughly wetted; then take old corn bags or hessian—corn bags are best—wet them and lay them over the beds. Remove the bags and

Plate IX.

Sisal Plants in Flower at St. Helena.

Plate X.



THE "RASPADOR" SISAL SCUTCHING-MACHINE AT WORK.

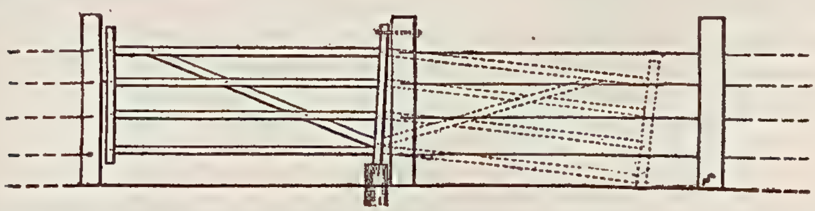
sprinkle the beds, and wet the bags and replace them on the beds about three times a week if it does not rain. In about ten days or two weeks begin to watch for the young plants; four or five days after they make their appearance arrange sticks around the bed and raise the bags about 2 inches off the bed, and continue to raise the bags as the plants grow. When the plants are about 2½ inches high, remove the covering in the cool of the day, but replace when the sun gets hot. Do this every day, letting them stay off a little longer each day until they are nearly large enough to transplant; then leave them off altogether. This is what we call hardening, and is necessary, that they might stand transplanting. Do not wait for rain to sow seed. When it rains, you want plants ready for setting out in the field. In order to get strong and vigorous plants, only the best and strongest seed should be sown, and, in order to get these, put the seed you intend sowing into a tumbler of water three or four hours before they are wanted. The strong vigorous seed will sink to the bottom, and the light ones will remain floating on the top. Pour these off, and sow only those that are left in the bottom of the glass. North of Mackay, seed may be sown at almost any time.

A USEFUL GATE.

Mr. W. A. Denyer, the Dene, Stanthorpe, sends the accompanying sketch and description of an accommodating gate which, when opened, will not suddenly fly back and violently impel the passenger into the next paddock.

For paddock gates the following description is of a useful form, which will drop gradually at its front end as it is swung open, so that it touches and rests on the ground when fully open. It is thus prevented from swinging to, and needs nothing to hold it open.

It is constructed by making the top rail 2 or 3 inches (varying with the size of gate) longer than the bottom rail, the intervening rails varying proportionally. The front upright is made to hang exactly vertically when closed, and at right angles to the crossbars. The back or hinge post consequently slants slightly outwards at the top. The accompanying sketch makes the working quite clear.



The dotted lines show the gate when opened. The gate is best hinged by a ring hinge at top, bolted through gate post (or a flat piece of hardwood with a hole in it for hinge post to run in, fixed on to top of gate post), and a block let into ground with a socket in which the bottom of hinge post is pivoted. The socket should not be placed exactly in front of the gate post and in the line of the fence, but a little off that line towards the side to which it is intended that the gate shall open. This will give the gate a slight lean at top towards the fence, which will tend to keep it closed when not purposely opened.

It must be swung so that when closed the bottom of front post is a few inches above the ground; in fact, adjusted sufficiently high to permit the gate to swing back open a sufficient distance before the front post touches the ground. This is a good pattern for a gate made of saplings.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

FIFTH LESSON.

HYDROGEN COMPOUND OF NITROGEN, AMMONIA AND AMMONIA SALTS, HYDROGEN COMPOUNDS OF CARBON OR HYDROCARBONS: METHANE, ACETYLENE, ILLUMINATING GAS.

Several compounds of nitrogen with hydrogen exist, but the only one of these compounds, of particular importance to us, is **Ammonia,** in which we find one atom of nitrogen combined with three atoms of hydrogen, giving the chemical formula NH_3.

In Nature, ammonia is only found in combination in the form of its salts. Small quantities of ammonia salts are always present in the atmosphere and in rain water. Ammonia salts form an important part of stable manure, and are due to the decomposition of the nitrogen compound **Urea,** which we already noticed in our Second Lesson. This change takes place most probably under the influence of micro-organisms, and may be expressed by the following chemical equations:—

$$\underset{\text{Urea.}}{CO\left\{\begin{matrix}-NH_2\\-NH_2\end{matrix}\right.} + H_2O = \underset{\text{Ammonia.}}{2NH_3} + \underset{\text{Carbonic acid gas.}}{CO_2}.$$

$$2NH_3 + CO_2 + H_2O = \underset{\text{Ammonium carbonate.}}{(NH_4)_2CO_3}.$$

The ammonia first liberated unites with the carbonic acid gas in the presence of moisture, and forms the salt ammonium carbonate.

Ammonia is produced in small quantities by the direct combination of nitrogen and hydrogen under the influence of electric discharges.

Ammonia is easily prepared by heating its watery solution, commonly known as **liquid ammonia** (*Liquor ammoniæ, Spirits of hartshorn*), and also by mixing and gently heating an ammonia salt with a caustic alkali, or with slaked lime (*Experiment 34*):—

$$\underset{\substack{\text{Ammonium}\\\text{chloride,}\\\text{or sal ammoniac.}}}{2NH_4Cl} + \underset{\substack{\text{Calcium}\\\text{hydroxide,}\\\text{or slaked lime.}}}{Ca(OH)_2} = \underset{\substack{\text{Calcium}\\\text{chloride.}}}{CaCl_2} + H_2O + \underset{\text{Ammonia.}}{2NH_3}.$$

Even before heating the mixture the pungent smell of the escaping ammonia gas may be noticed. The presence of ammonia gas is shown by the action on red litmus paper, which, due to the alkaline reaction of ammonia, will turn blue; or, again, by the action on yellow turmeric paper, which will turn brown. Bringing a glass rod moistened with strong hydrochloric acid near to the escaping ammonia gas, white fumes of ammonium chloride will be formed:—

$$NH_3 + HCl = NH_4Cl.$$

Ammonia is a colourless gas, much lighter than air, and may be collected in a glass flask, with its opening pointing downwards, by displacing the air (*Experiment 35*). After the flask is filled, the two glass tubes are closed with small corks, and the flask is placed over a dish containing water, just made slightly red with litmus solution and a few drops of acid, and so arranged that the longer tubes dips into the water. When removing the small cork underneath the water, the water will rush with great force into the flask, forming a

solution of ammonia in water, which will change the red solution into blue. By passing ammonia gas into water a solution of liquid ammonia is obtained, which possesses all the properties of ammonia gas, and which gives the gas off again on boiling. At 32 degrees Fahr., the freezing temperature of water, 1 part of water can absorb 1148 parts of ammonia gas, and at a temperature of 85 degrees Fahr. about 530 parts. Ammonia gas is easily liquified under pressure, and large cylinders containing such liquified ammonia are used in freezing works and dairies for the production of low temperatures with the help of refrigerating machinery. When the pressure is released by opening a valve in the cylinder, the ammonia exaporates very rapidly, and in doing so absorbs an enormous amount of heat from its surroundings. The gas, after having done its work, is again compressed by machinery and made ready for use again.

Weak solutions of ammonia are frequently used in the household for cleaning of silver, washing of flannels, relieving the effects of insect bites, &c.

Ammonia in its solution acts similarly to a solution of caustic soda or potash, and is one of our strongest alkalies. We assume that in the watery solution ammonia exists in the form of *Ammonium hydroxide*, after the equation: $NH_3 + H_2O = NH_4—OH$, analogous to the composition of Sodium hydroxide Na—OH, in which the group of elements NH_4, **Ammonium** (called a radical or radicle), takes the place of a metallic atom. This group NH_4 forms salts by combining with acid radicals, which salts are called **Ammonium salts.** These salts are of the utmost importance to agriculture, as they form the chief source of the nitrogen supply of plant life. Plants, however, do not assimilate the nitrogen in the form of ammonium salts, but only in the form of *nitrates*, which latter are produced from the ammonia salts by the process of *nitrification*, already mentioned in our Second Lesson.

The ready decomposition of ammonium salts by caustic lime must be borne in mind when mixing artificial manures, and no ammonium salt should ever be mixed with lime or any other manure having caustic properties—like, for instance, basic slag or Thomas phosphate—as it would lead to a direct loss of ammonia.

Soil rich in organic matters (humus) has the power to absorb ammonia, and for this reason, by covering manure heaps with decaying vegetable matters and layers of soil, the loss of ammonia may be prevented.

Ammonium sulphate, or *Sulphate of ammonia* $(NH_4)_2SO_4$, is obtained on a large scale by neutralising the ammoniacal liquor of gasworks with sulphuric acid and evaporating the liquid. The crude salt first obtained is used as a manure. The pure salt forms colourless crystals, easily soluble in water.

By impregnating muslin with a weak solution of ammonium sulphate the material will, after drying, not burn with a flame (*Experiment 36*).

The manufacture of this salt is of considerable magnitude, the United Kingdom alone producing in 1901 about 220,000 tons of this salt, of a value of about £1,500,000, nearly two-thirds of this being simply the by-product of gasworks.

Ammonium carbonate (*Smelling salts, Preston salts*) is of varying composition; it is used in medicine (as *sal volatile* in an alcoholic solution), and also by confectioners and bakers for giving lightness and porosity to cakes and bread.

Ammonium carbonate is always produced by the decomposition and putrefaction of nitrogenous matters, and is always present in stable manure. It is also formed by the dry distillation of many nitrogenous compounds, like horn, glue, flesh, dung, &c., with an alkali. In ancient times the salt was produced by the distillation of camel's dung, and also by the distillation of horn (*salts of hartshorn*).

In commerce, this salt generally appears as a white crystalline mass, which always smells strongly of ammonia, being volatile with decomposition. It is soluble in water, and the solution has an alkaline taste and an alkaline reaction. When adding gradually dilute sulphuric acid to a solution of ammonium carbonate, a decomposition with effervescence takes place, carbonic acid gas being given off and ammonium sulphate being formed (*Experiment 37*).

$$\underset{\text{Normal ammonium carbonate.}}{(NH_4)_2\,CO_3} + H_2SO_4 = (NH_4)_2\,SO_4 + H_2O + CO_2.$$

By adding the acid very gradually a point will be reached, just when all effervescence stops, in which the resulting liquid has a neutral reaction, being neither alkaline nor acid. The ready decomposition of ammonium carbonate must be kept in mind in the formation of manure heaps; and overheating, which would hasten decomposition and loss of ammonia, must be avoided.

Ammonium chloride (*sal ammoniac*) may be obtained by neutralising ammonia with hydrochloric acid or by decomposition of ammonium carbonate with hydrochloric acid. The sal ammoniac of commerce is a tough, white, translucent fibry mass, which does not smell of ammonia. It is very soluble in water, and during this solution the temperature is considerably lowered, and for this reason the salt is used for cooling and freezing mixtures (*Experiment 38*). On evaporation of the clear solution, the salt deposits again in the form of minute white crystals. When sal ammoniac is heated, it vaporises, forming thick white clouds, which deposit on a cold surface white crusts of the pure salt (*Experiment 39*). Ammonium chloride is used for the cleaning of metallic surfaces before soldering, and for this purpose it is used by plumbers.

Hydrocarbons, or Hydrogen Compounds of Carbon.—Carbon and hydrogen form a very large number of compounds containing different numbers of carbon and hydrogen atoms, due to the peculiar property of the carbon atoms to unite amongst themselves and forming chains and rings of carbon atoms.

The simplest of these compounds is:—

Methane, CH_4, also called *Marsh gas* and *Firedamp.*

The gas is found in a free state, and escapes in large quantities from the earth in the neighbourhood of coal mines and petroleum springs. The gas also is found in marshy places and swamps, and bubbles of the gas rise to the surface when the mud at the bottom of such places is disturbed. The gas is a mixture of marsh gas and carbonic acid gas, and is formed by the slow decomposition (a moist combustion) of the organic matters. The gas may be produced by strongly heating in a flask or copper tube a mixture of sodium acetate and caustic soda (*Experiment 40*)—

$$\underset{\text{Sodium acetate.}}{CH_3\text{—}COONa} + NaOH = \underset{\text{Soda.}}{Na_2CO_3} + \underset{\text{Methane.}}{CH_4},$$

and will be found to be a light, colourless gas, having neither taste nor smell, which burns with a yellowish, faintly luminous flame, producing carbonic acid gas and water vapours—

$$CH_4 + 2O_2 = CO_2 + 2H_2O.$$

Mixing the gas with oxygen, or with air in certain proportions, and igniting the mixture, a violent explosion will occur. Such explosions frequently take place in badly-ventilated coal mines, due to the escape of marsh gas or firedamp, and can only be prevented by the strict prohibition of the use of naked lights in mines, and by using only lamps guarded by a screen of fine wire gauze (*Davy safety lamp*), which prevents ignition of the explosive mixture by the flame. The presence of firedamp is also detected by slight explosions taking place within the cages of these lamps.

Acetylene, C_2H_2, is an unsaturated hydrocarbon, as in this compound two carbon atoms are linked together, leaving only two affinities free for combination with hydrogen—

$$H-C\equiv C-H = C_2H_2 \qquad \begin{array}{c} H \\ | \\ H-C-H \\ | \\ H \end{array} = CH_4 \text{ methane}$$

Acetylene.

Acetylene is easily prepared on a large scale by adding water to *calcium carbide*—

$$CaC_2 + 2H_2 = Ca(OH)_2 + C_2H_2,$$

which may be shown by an experiment by dropping water slowly on to carbide contained in a small two-necked bottle (*Experiment 41*). The calcium carbide is prepared by the direct combination of carbon and calcium in an electrical furnace. Acetylene is a colourless gas, having a peculiar disagreeable odour. It burns with a very white, smoky flame, but burned in gas jets of special construction gives an intense white light. With air acetylene forms also an explosive mixture.

Coal Gas (*illuminating gas*).—All hydrocarbons are of special importance as illuminating and heating materials. Ordinary illuminating gas is obtained by the destructive distillation of coal, and consists chiefly of marsh gas, hydrogen, smaller amounts of carbonic oxide, nitrogen, acetylene, and other hydrocarbons. Injurious constituents are sulphureted hydrogen (H_2S), carbon bisulphide (CS_2), which are formed when coals contain much sulphur; and these impurities in the gas have to be removed by purification.

Coal is heated to red heat in retorts, and the escaping gas is cooled, washed with water (in the scrubbers), passed over slaked lime, and finally into the gas-holders. By-products of the manufacture are coal tar—from which again carbolic acid, aniline, naphthalene, &c., are obtained—coal naphtha, benzol, paraffin, pitch, ammoniacal liquor, and finally the coke left in the retorts.

The Structure of Flame.—Intimately connected with the study of the hydrocarbons is the property and the structure of an ordinary flame. Every candle and every kerosene lamp must be considered as a gas factory on a small scale. By capillarity the molten fat or the kerosene rises in the wicks, to be changed by the heat of the flame into gaseous products, which gases burn and produce the visible flame. The luminosity of the flame itself is due to the presence of minute carbon particles heated to incandescence. We have already noticed that a methane flame gave very little light, due to the absence of such carbon particles, whereas acetylene, which is very much richer in carbon, gives a smoky white flame. If we examine the flame of a burning candle (Fig. 4B) closely, we will notice that it consists of three distinct concentric cones:—(1) the *centre cone* (*a*) surrounding the wick, appearing almost black, formed by the gaseous products of destructive distillation; (2) a bright yellowish white *luminous mantle* (*b*), in which partial combustion is taking place; and (3) a faintly luminous but very hot *outer mantle* (*c*), hardly visible in daylight, in which complete combustion takes place. We can further notice at the base of the flame a blue cup (*d*), in which the combustion is also complete. We can show the absence of heat in the centre cone by holding a wooden match for a moment in the flame; a part in the middle will remain uncharred (*Experiment 42*). When holding a cold substance like a piece of porcelain or a knife into the flame, it will be covered with soot, proving the presence of free carbon. By blowing air into the flame with the help of a blowpipe we can increase the heat of the flame considerably by obtaining a more perfect combustion, but at the same time a non-luminous flame. The presence of combustible gases may be shown by pressing a piece of wire gauze upon the flame, close to the wick, when the escaping gas may be again kindled

above the piece of gauze. This experiment could be shown much better with the flame of a gas burner, and explains the action of the Davy safety lamp. The air surrounding the flame cannot reach the innermost cone, so that no combustion takes place there. In the second cone the hydrogen only of the hydrocarbons burns, producing thereby sufficient heat to heat the liberated carbon particles to incandescence. These carbon particles again burn in the outer mantle, where a sufficient supply of oxygen is available. The non-luminous mantle is much thinner than the luminous cone; the bright blue cup at the bottom of the flame is formed by a complete combustion of a small portion of the hydrocarbons. In the construction of gas burners, the question must be kept in view if the flame produced is to be used for heating or for lighting. For heating we require a non-luminous flame, obtained by burning the gas with a good supply of air. In an ordinary "Bunsen burner" the gas escapes from a small jet into a wider tube, which has openings for the admission of air at the base. The gas in rushing up the tube draws air in, gets mixed with the air, and burns with a hot bluish flame. By closing the air-holes the flame will become luminous.

Heating.—The amount of heat produced by the combustion of ordinary fuels depends chiefly on the amounts of carbon and hydrogen they contain. A regular and plentiful supply of oxygen from the air is of the utmost importance to obtain a perfect combustion without smoke; the formation of heavy smoke always shows that a waste of heat and fuel takes place. The heat may be increased by forcing air through the fires (artificial and forced draught).

The amount of heat produced by combustion is measured by the quantity of water which may have its temperature raised by 1 degree by the burning of 1 unit weight of fuel. The unit of heat necessary to raise the temperature of 1 unit weight of water from 0 degrees to 1 degrees Centigrade is called a *calory.*

The calorific value of hydrogen is 34,400, which means that when 1 lb. of hydrogen gas is burned sufficient heat is produced to raise the temperature of 34,400 lb. of water by 1 degree. The calorific value of pure carbon is 8,080, and the more or less impure varieties of coal have a lesser calorific value.

Coal and charcoal have a calorific value from			7,000 to 8,000
lignite	,,	,,	3,500 to 6,570
peat	,,	,,	2,500 to 4,000
wood	,,	,,	3,000 to 4,000
petroleum	,,	,,	14,000

This table shows the great advantage of liquid fuel—kerosene—over the solid fuels—wood or coal.

APPENDIX TO FIFTH LESSON.

RADICALS OR RADICLES are groups of atoms of different elements, which are not capable of separate existence, but take part in chemical reactions, and can be substituted for the atoms of other elements. Water contains the radical —OH, the hydroxyl group, in combination with H as H—OH. Caustic soda contains the same radical, Na—OH, and in ammonia we find a combination of two radicals, NH_4—OH.

Experiment 34.—Prepare ammonia as explained in text, and show presence by action on litmus paper, turmeric paper, and on glass rod moistened with NCl.

Experiment 35.—Fill a flask arranged as Fig. 4A with ammonia gas, and show its great affinity for water by opening the tube dipping into water.

Experiment 36.—Dissolve 1 part of $(NH_4)_2SO_4$ in 10 parts of water, and dip a piece of muslin or fine calico into the liquid, and allow to dry. Show the difference in burning between a treated and untreated piece.

Experiment 37.—Add dilute sulphuric acid slowly to a solution of ammonium carbonate. Show the action on litmus paper when still alkaline, when neutral, and and when acid. Explain the action of neutralising.

Experiment 38.—Add water to powdered sal ammoniac in a flask, and show the great fall of temperature.

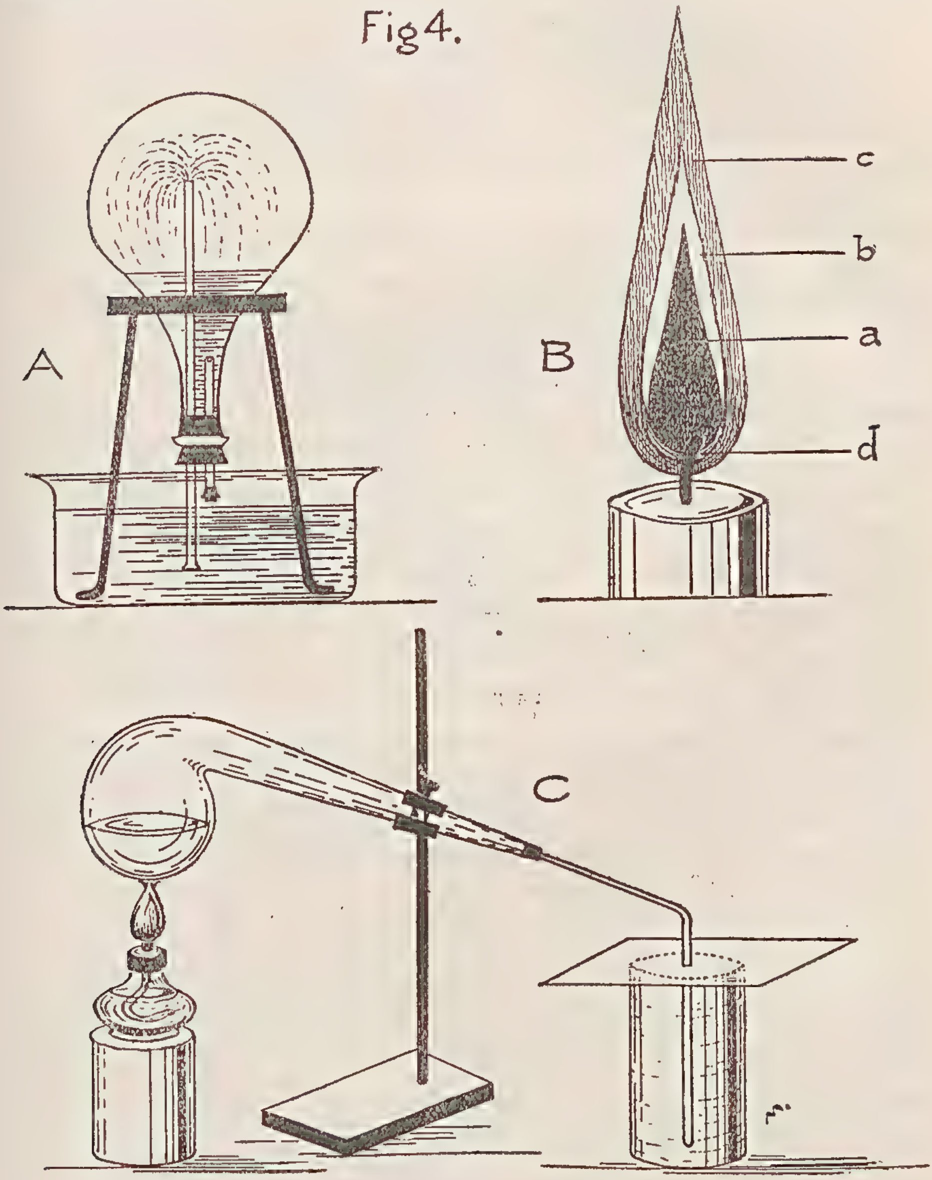
Experiment 39.—Heat sal ammoniac in a test tube.

Experiment 40.—Dried sodium acetate is mixed with an equal quantity of soda lime and heated in a flask, retort, or large test tube, and the gas collected over water or in a cylinder with its opening down. Show how gas burns. Mix a small quantity of air and gas in a test tube, and light.

Experiment 41.—Let water drop on to small pieces of carbide contained in a small flask or two-necked bottle. Do not ignite gas until the gas has been formed for some time, and all air has been driven out of the apparatus.

Experiment 42.—Show the nature of a candle flame, as explained by tests in text.

Fig 4.



Questions to Fifth Lesson.

1. What is the composition of ammonia?
2. How is ammonia found in Nature?
3. Explain the presence of ammonia salts in stable manure.
4. When preparing mixtures of artificial manures, can ammonia salts be mixed with any other substance?
5. How can you prepare ammonia gas, and show that it is produced?
6. Can plants make direct use of an ammoniacal manure?

7. How is loss of ammonia prevented in the preparation of compost heaps?
8. What is the difference between saturated and unsaturated hydrocarbons?
9. Why are the hydrocarbons the chief constituents of liquid and gaseous fuels used for heating and lighting?
10. What is fire damp?
11. How may explosion in coalmines be avoided?
12. Why should no one test for a leak in a gas pipe in a closed room with a burning match?
13. What is the cause of the difference between the flames of burning methane and acetylene?
14. How is coal gas manufactured, and which are the principal by-products?
15. Which part of a candle flame is the hottest, and which is the coolest?
16. What is the object of using a blow pipe?
17. What will give more heat—one pound of kerosene or one pound of coal?
18. How is artificial cold produced by refrigerating machinery?

SIXTH LESSON.

THE EARTH. SUBSTANCES FORMING THE INORGANIC OR MINERAL PARTS OF PLANTS, ANIMALS, AND SOILS.

NON-METALLIC ELEMENTS: SILICON, PHOSPHORUS, SULPHUR, CHLORINE, AND THEIR MOST IMPORTANT COMPOUNDS.

When a plant or an animal body is burned a small amount of mineral matter—**ash**—remains after the incineration is completed. Analysis will show that in the composition of such ashes only a few elements commonly take part: The *non-metallic elements*, **Silicon, Phosphorus, Sulphur, Chlorine,** and **Fluorine**; and the *metallic elements*, **Potassium, Sodium calcium, Magnesium, Iron, Manganese,** and **Aluminium.** An enormous amount of ash analyses have been carried out all over the world, and it was found that, although the composition of the ashes of each substance may vary within certain limits, the ashes of certain plants are characterised by one or the other of the elements predominating. The mineral matters found in plants are entirely supplied from the soil, and the presence of the elements above mentioned is an absolute necessity for the growth of the plants. The composition of the ash of plants grown under normal conditions will again be an indication what elements have to be chiefly supplied if wanting in the soil or exhausted by continuous cropping. Animals derive their mineral matters entirely from the food they consume, and the elements sodium, chlorine, and fluorine are of much more importance to animal life than to plants.

Silicon.—This element is the most abundant element in the mineral world, forming about 27 per cent. by weight of the solid crust of the earth. It is not found in a free state, but in combination with oxygen as **Silica,** SiO_2 (silicic acid), and in the form of metallic salts of this weak acid, called **Silicates.** Silica, SiO_2 is the chemical name of the mineral known as *rock crystal, flint, quartz,* and common sand. Silica can only be fused at an exceedingly high temperature, and is only soluble in hydrofluoric acid. Like carbonic acid, silicic acid is a very weak acid, but is able to expel carbonic acid from carbonates, when fusing silica and an alkaline carbonate together (*Experiment 43*). Mixing very finely powdered quartz sand with about six times its weight of a mixture of sodium and potassium carbonate, and fusing this mixture on a small piece of platinum foil in a blowpipe flame, a glassy mass is produced, which is almost entirely soluble in water, forming a gelatinous solution called **water glass.** A dilute solution of this substance may be successfully used for the preservation of eggs. On the addition of hydrochloric acid to a solution of water glass (*Experiment 44*), and evaporating the solution slightly, a gelatinous mass of **hydrated silica,** H_2SiO_3, is obtained.

The greatest number of minerals known are silicates. *Clay,* or in its purest form called *kaolin,* is an aluminium silicate. *Feldspar,* one of the minerals found in *granite,* is a double silicate of aluminium and potassium.

All kinds of artificial glass are silicates of various metals.

Silica and silicates are only very slightly soluble in water, some spring waters containing small amounts of silica in solution. Waters in volcanic districts, the *geysers* of Iceland and New Zealand, contain larger amounts of silica

in solution, which is deposited in thick layers round the opening of these springs, or petrifies any object—wood, plants—immersed for some time in such springs.

Silica is generally found in plant ashes, more particularly in the stems and leaves of grasses and cereals, in reeds and rushes, but it does not seem absolutely necessary to their growth.

Phosphorus.—Although this element is generally only found in very small quantities, it is still of the greatest importance, and absolutely indispensable to animal and plant life. Soil, as a rule, contains rarely more than 1 or 2 parts in 10,000 parts of soil; but still this small amount is all the available supply for the growing plants, which accumulate the phosphorus in larger amounts in their seeds, and from the plants again the animals obtain the large amount of phosphorus required for the building up of bones, teeth, and shells. Phosphorus is not found in a free state, only in combination with other elements, mostly in the form of **Phosphates.**

The element phosphorus is prepared from bone ash, which contains from 20 to 25 per cent. of phosphorus. It is a transparent, yellowish, wax-like solid, which soon loses its transparency by being coated with a white film. Exposed to the light, the colour also very soon darkens. In the dark and exposed to moist air, phosphorus is faintly luminous. Exposed to the air, phosphorus gives off poisonous white fumes of unpleasant smell. Phosphorus is highly inflammable, and on rubbing a small piece of phosphorus, or slightly heating, it bursts into a brilliant white flame, evolving white fumes of **Phosphoric oxide,** P_2O_5 (*Experiment 45*). In order to prevent the combustion of phosphorus, it has to be kept under water, in which it is insoluble. Phosphorus is soluble in alcohol, ether, and particularly in bisulphide of carbon. The ordinary yellow phosphorus is extremely poisonous. It is used in the preparation of poisonous baits for rats and rabbits, in the manufacture of matches, in medicine, &c. When phosphorus is heated under exclusion of air, it is changed into a different allotropic modification: **Red Phosphorus,** which is not so inflammable, and not so poisonous. In the manufacture of safety matches no phosphorus is used for the heads of the matches, but red phosphorus is used in the preparation with which the surface is coated on which the matches have to be rubbed to be ignited.

Phosphoric Acid is found in the form of its salts, and more particularly the lime salt (*Calcium phosphate*) in various minerals, as apatite, phosphorite, and coprolite. When phosphorus is burned under a bell jar, the white fumes collect on the glass in the form of snowy flakes. By adding water to this powder, under evolution of heat, a solution of phosphoric acid is produced—

$$P2O_5 + {}_3H_2O = {}_2H_3PO_4 = P\begin{cases} = O \\ - OH \\ - OH \\ - OH \end{cases}$$

Phosphoric acid may also be produced by decomposing bone ash with strong sulphuric acid. Phosphoric acid in dilute solution is not poisonous, and has a strong acid taste and acid reaction. As seen from the formula given above, phosphoric acid has three hydroxyl radicals, or 3 atoms of hydrogen which can be replaced by metals, and is consequently a tribasic acid. Phosphoric acid from this reason is capable of forming three series of salts, in which one or two or all three hydrogen atoms are replaced by metals. We have, for instance, the following three sodium salts:—

Dihydrogen sodium phosphate, H_2NaPO_4.
Hydrogen disodium phosphate, HNa_2PO_4.
Trisodium phosphate, or normal sodium phosphate, Na_3PO_4.

In Nature only the normal salts are found. With lime a still greater number of compounds exist, and these are of particular importance to agriculture on account of their manurial value.

We have—

Tricalcium phosphate, $Ca_3(PO_4)_2$, the normal phosphate (bone ash)
Dicalcium phosphate, $Ca_2H_2(PO_4)_2$
Monocalcium phosphate, $CaH_4(PO_4)_2$
Tetracalcium phosphate, $Ca_4P_2O_9$ or $CaO.Ca_3(PO_4)_2$

which all vary with regard to their solubility.

Tricalcium phosphate is the form chiefly found in bones, bone ash, mineral phosphates, and in guano. It is very slightly soluble in water, but a little more soluble in water saturated with carbonic acid, and is also soluble in strong acids. *Dicalcium phosphate* is more soluble than the former, and particularly more soluble in water containing carbonic acid or weak organic acids and their salts.

Monocalcium phosphate is chiefly found in superphosphate, manufactured from bones by treating them with strong sulphuric acid. It is very soluble in water.

Tetracalcium phosphate is a basic phosphate found in fairly large proportion in the slag, a by-product in the manufacture of Bessemer steel. It is insoluble in water, but fairly soluble in saline and in weaker acid solutions.

We have already learned that phosphoric acid is only present in very minute quantities in our soils, but it is one of the most important factors in the fertility of a soil, and for this reason phosphoric acid is one of the substances which must be supplied in form of manure to soil, in order to prevent exhaustion by the plant crops, and to keep it productive.

The preparation and the uses of the various phosphates as manures will be more fully discussed in a later lesson.

Sulphur.— This element is found in large quantities in its free state in many volcanic districts. In combination with metals, sulphur is found in the form of **sulphides** in a great number of ores—for instance, in *Iron pyrites* Fe_2S, *galena* PbS (lead sulphide), *blende* or zinc sulphide ZnS; *cinnabar*, mercuric sulphide, HgS. Combined with hydrogen, sulphur is found as *sulphureted hydrogen*, H_2S, in many mineral waters; again, combined with oxygen and metals, in many minerals as **sulphates**—for instance, *gypsum* or calcium sulphate $CaSO_4 + 2H_2O$. In plant life sulphur is found in the form of sulphates, and also as a constituent of the nitrogenous compounds **Albuminoids** or **Proteids.** The pungent essential oils found in mustard and garlic also contain sulphur.

Sulphur is one of the elements essential to plant life. In the animal bodies sulphur is found in larger quantities in the hair and wool.

Sulphur is prepared from native sulphur by the action of heat, by simply melting the sulphur out or by evaporating it and condensing the sulphur vapours in another vessel. From sulphur ores it may be obtained by roasting them, under the exclusion of air. Commercial sulphur is found in the form of *roll sulphur*, and in the form of a fine powder, *flowers of sulphur*.

The peculiar physical changes taking place when sulphur is heated, we have already noticed in our First Lesson.

Sulphur is used in the manufacture of gunpowder and of sulphuric acid. Flowers of sulphur are used for the prevention of mildew on roses and other plants. Burning sulphur may be used for the disinfection of rooms, cleaning of wine and beer casks, &c. With oxygen, sulphur forms several compounds, of which, however, only two are of importance to us.

Sulphur dioxide or Sulphurous acid gas, SO_2. This gas is formed when sulphur is burned, and is well known to everyone by its peculiar suffocating odour. The gas, like carbonic acid gas, has the power of extinguishing flames,

and, in the case of the soot in a chimney being on fire, the fire is generally put out by burning a few rolls of sulphur in the fireplace. Sulphurous acid gas has a very powerful action in destroying lower forms of animal and vegetable growths. This property is made use of in sulphuring wine and beer casks. The gas has also the property of destroying colouring matters, and is used for this reason for the bleaching of wool, silk, straw, &c. A few flowers, previously moistened, suspended in a bell jar under which sulphur is burning, will soon lose their colour (*Experiment 46*). **Sulphuric acid,** H_2SO_4, *oil of vitriol.* Commercial sulphuric acid is prepared on a very large scale by burning sulphur or pyrites, and passing the sulphurous acid gas obtained, mixed with water vapours, air, nitric acid vapours, into large chambers entirely constructed from sheet lead. The sulphurous acid is oxidised by taking up more oxygen, and is changed into sulphuric acid. One pound of sulphur produces about 3 lb. of commercial strong sulphuric acid.

Sulphuric acid is an oily, heavy liquid, without any distinct acid odour, which, when mixed with water, produces a very high temperature. Great care in mixing the acid with water has to be taken, and the acid, when it is to be diluted, has always to be run into the water in a small stream ; never run water into acid. Sulphuric acid has a very great attraction for water, and organic substances brought in contact with the strong acid are almost immediately charred (*Experiment 47*). The salts of sulphuric acid are called *Sulphates,* most of which are soluble in water. A few of the most important salts are :—

Soldium sulphate $Na_2SO_4 + 10H_2O$, or *Glauber's salt.*
Magnesium sulphate, $MgSO_4 + 7H_2O$, or *Epsom salts* (*salts*).
Iron sulphate, $FeSO_4 + 7H_2O$, *green vitriol* or *copperas.*
Copper sulphate, $CuSO_4 + 5H_2O$, *blue vitriol* or *bluestone.*

The most insoluble sulphate is the *Barium sulphate,* $BaSO_4$ (*heavy spar*); and this substance, on account of its insolubility, is made use of in the analytical determination of sulphuric acid, as by adding a solution of Barium chloride to a solution of sulphuric acid or any sulphate a white precipitate of Barium sulphate is at once formed (*Experiment 48*)—

$$BaCl_2 + Na_2SO_4 = 2NaCl + BaSO_4.$$

Sulphuric acid is largely used in the manufacture of artificial manures, chiefly superphosphate, ammonium sulphate, and potassium sulphate.

Chlorine, Cl, is chiefly found in Nature in the form of **Sodium chloride,** NaCl, or *Rock salt.*

It is a greenish-yellow heavy gas, possessing a strong suffocating smell. It is easily prepared by heating in a flask hydrochloric acid with black oxide of manganese—

$$4HCl + MnO_2 = MnCl_2 + H_2O + Cl_2;$$

or by heating a mixture of common salt, black oxide, and dilute sulphuric acid—

$$2NaCl + MnO_2 + 2H_2SO_4 = Na_2SO_4 + MnSO_4 + 2H_2O + Cl_2;$$

the gas being collected over water (*Experiment 49*), or, by being much heavier than air, it may be collected in an upright cylinder.

Chlorine has a powerful attraction for many elements, as sulphur, phosphorus, which all burn in chlorine with brilliant flames. Nearly all metals are strongly attacked by chlorine gas. The gas has a particular powerful attraction for hydrogen gas ; and a mixture of equal volumes of chlorine and hydrogen prepared in the dark will explode with great violence when exposed to the light, under formation of hydrochloric acid gas.

Chlorine gas has a bleaching action on colouring matters, but many fabrics, particularly silk and wool, are injured by the action of the gas. Chlorine gas is also a powerful disinfectant.

Hydrochloric acid, HCl, is found free in Nature in the gases escaping from volcanoes.

It is easily prepared by heating salt with sulphuric acid (*Experiment 50*),

$$NaCl + H_2SO_4 = \underset{\text{Hydrogen Sodium sulphate.}}{NaHSO_4} + HCl,$$

when dense fumes of acid with a very suffocating odour are given off. The gas is very soluble in water, forming liquid commerical hydrochloric acid, also called *muriatic acid* and *spirits of salts*. The common crude acid has generally a yellow colour, due to different impurities, chiefly iron salts. Large quantities of hydrochloric acid are produced as by-products of alkali and other chemical works, as the gas is not allowed to escape into the air, but must be condensed. Very small amounts of escaping hydrochloric acid gas kill the vegetation in the neighbourhood of such works, and 1 part of HCl in 20,000 parts of air is fatal to most plants.

The salts of hydrochloric acid are called *chlorides*, and the most important is *common salt—Sodium chloride,* NaCl.

Most of the metals are dissolved in hydrochloric acid under formation of their chlorides.

Closely related to Chlorine, and belonging to one group of chemical elements, are the elements **Bromine, Iodine,** and **Fluorine,** which are found in the form of their salts in small quantities in sea water, and fluorine in small quantities in bones and teeth of animals.

Bromine is a reddish-brown heavy liquid, with a disagreeable suffocating smell.

Iodine is a solid, of dark colour and metallic lustre, generally in form of thin flakes. When heated it forms heavy vapours (*Experiment 51*), having a smell resembling chlorine. The vapours stain paper and skin yellow. It is soluble in alcohol, forming a brown solution, called *tincture of iodine* (*Experiment 52*). In bisulphide of carbon, iodine dissolves with a beautiful violet colour. Iodine has the property of colouring starch intensely blue; by preparing a thin starch paste and adding a few drops of this paste to some water in a test tube, the addition of a few drops of an alcoholic or a watery iodine solution will produce a deep blue colour.

Fluorine is a colourless, poisonous, and very corrosive gas, more powerful in its properties than chlorine. In Nature it is found in combination as as *fluorspar,* calcium fluoride, CaF_2.

Hydrofluoric acid, prepared from fluorspar by the action of sulphuric acid, dissolves silica, and is for this reason used for etching glass.

APPENDIX TO SIXTH LESSON.

The group of elements chlorine, bromine, &c., is called the *Halogen group,* from their tendency of producing by the direct action on metals salts resembling sea salt. These salts are called haloid salts. The elements show a great similarity in their chemical properties, and show a great regularity of gradation with regard to their atomic weight, physical properties, &c.

Experiment 43.—Silica finely powdered and sodium carbonate, or, better, a mixture of sodium and potassium carbonate, are fused on a platinum foil or on a piece of charcoal in the blowpipe flame. Show the solubility in water, and formation of gelatinous silicic acid with hydrochloric acid, as in *Experiment 44,* where water glass is similarly treated.

Experiment 45.—Burn a small piece of phosphorus under a bell jar; collect the oxide formed, and show how it dissolves in water and forms an acid solution.

Experiment 46.—Suspend a few coloured flowers in a bell jar in which a small piece of rock sulphur is burned. Show how action is much slower if flowers are quite dry.

Experiment 47.—Show the action of strong sulphuric acid on wood, sugar, bones.

Experiment 48.—Show the precipitate formed by adding barium chloride to either dilute sulphuric acid or to solution of a soluble sulphate.

Experiment 49.—Prepare chlorine gas in an apparatus, as shown in Fig. 4c, by heating hydrochloric acid with black oxide of manganese, or heating a mixture of 200 grains of salt with 150 grains of black oxide with a solution of ½ oz. of sulphuric acid in 1½ oz. of water. Fill a few bottles with the gas, and show bleaching action on flowers, and the burning of sulphur and phosphorus.

Experiment 50.—Heat a mixture of salt and sulphuric acid in a test tube; show the acid nature of vapours by action on litmus paper.

Experiment 51.—A few crystals of iodine are to be heated in a test tube.

Experiment 52.—Prepare solutions of iodine in alcohol and bisulphide of carbon, and show the action of iodine solution on a weak solution of starch paste or on a slice of potato.

QUESTIONS TO SIXTH LESSON.

1. What is silica, and how is it found in Nature?
2. How may quartz sand be changed into a soluble form?
3. What is water glass, and its use?
4. What are the properties of phosphorus?
5. Is phosphorous an element necessary to plant and animal life?
6. In what form is phosphorus used by plants?
7. What is phosphoric acid, and how may it be prepared?
8. Why is phosphoric acid called a tribasic acid?
9. Enumerate the most important lime or calcium salts of phosphoric acid?
10. Which are the more soluble of these salts?
11. Which parts of the plants contain the most phosphorus?
12. How does sulphur exist in Nature?
13. Is sulphur a plant food?
14. Which compounds of vegetable nature contain sulphur?
15. How is sulphuric acid prepared?
16. What are the most important properties of sulphurous acid?
17. Why are organic substances charred when brought in contact with sulphuric acid?
18. How may sulphuric acid be determined analytically?
19. Which are the elements belonging to the Chlorine group of elements?
20. What is a characteristic reagent for starch?

KEEPING LEMON OR LIME JUICE.

The juice as it is squeezed out from the fruit is allowed to rest for twenty-four hours, until a sediment collects at the bottom of the vessel. Then the clear liquid is decanted and reduced by heat to one-third of its volume—*i.e.*, 3 quarts of juice would be reduced to 1 quart. The heating process should not be done by direct fire, but by standing the vessel containing juice into a copper or some large vessel over the fire. On a large scale, a water bath or steam circulating in a jacket boiler could be used. In any case, the vessel in which the juice is heated should be enamelled.

The juice may be sweetened by adding 4 to 5 lb. of sugar for every gallon of juice before it is reduced to heat. It is bottled when cool, but before bottling it may require straining or filtering.

To prevent deterioration by mould, the bottles, which are filled to an inch from the cork (which is tied down), are placed standing in a flat-bottomed boiler. Water is placed in the boiler up to an inch from the neck of the bottles, and then heated by direct fire up to 170 degrees Fahr., and kept at that temperature for about twenty-five minutes. Then they are removed and laid on one side, *never standing*. To prevent heating of the bottles, it would be well to have a false perforated bottom of wooden battens placed in the boilers.

The method of keeping fresh lemon juice, as used in the navies, is to add 10 per cent. of brandy—that is, 1 gallon of brandy to 9 gallons of juice, after it has been heated.—*Journal of the Jamaica Agricultural Society.*

Science.

EASY METHOD OF PREVENTING DEATH FROM SNAKE-BITE.

For the next three or four months snakes of all kinds will be in full vigour and activity, and although deaths from snake-bite are rare in Queensland, still those whose business takes them into the neighbourhood of swamps will run the risk of unwarily treading on a black snake in the same way as the bushman whose work lies on dry ridgy land is liable to make acquaintance with a deaf adder. Queensland snakes are, as a rule, shy, and nearly always try to escape from man, but when suddenly molested they are apt to show fight, and a deadly stroke of the poison fang may endanger the life of a victim who is far from medical help. We therefore think that a timely publication of a paper under the above heading, by Sir Lauder Brunton, Sir J. Fayrer, and Dr. L. Rogers, which appeared in the Proceedings of the Royal Society (Eng.), Vol. 73, No. 494, p. 323, will be appreciated.

Following is an abstract of the paper:—

The treatment advocated in this paper is the net result of experiments made with the venoms of each main division of snakes, including especially that of the cobra. The Australian black and brown snakes belong to the same family as the Indian cobra, and the venoms of all these snakes, it may be parenthetically remarked, have the effect of clotting the blood of any person or animal bitten. The venom of deaf adders does not have this effect.

The experiments show that if cobra venom be mixed with a 1 per cent. solution of permanganate of potash the activity of the poison is destroyed and it becomes innocuous. Further, that if a solution of the permanganate be injected into the tissues close to the place where snake venom has been just previously injected, say within from one or two up to five or even ten minutes after the injection of the venom, either no symptoms of snake-poisoning occur or a fatal result is averted, and the poisonous effects are more or less mitigated.

The result varies according as the interval which elapses before the antidote is applied is longer or shorter, and is successful in the same measure as the permanganate is actually able to overtake the venom and mix with it before it has been absorbed by the system. *For whatever part of the venom is brought into actual contact with the permanganate is rendered inert and harmless*, whilst the antidote has no effect whatever on that part which has been actually absorbed into the system. It is, therefore, of no use taken internally, and of very problematic value if applied to or injected into the snake-bite after any considerable lapse of time, especially if no ligature has previously been applied to stop the circulation in the locality of the bite.

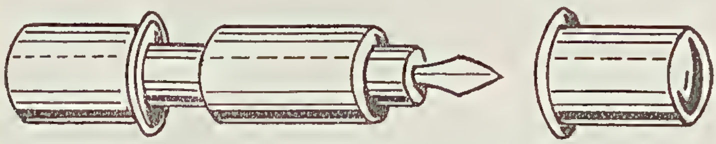
It is estimated that the solid permanganate of potash will neutralise its own weight of venom when directly mixed with it, either solid or in a solution; moreover, it acts on every class of venom, including that of deaf adders, &c.

Snake venom is cumulative in its action, which means that the ultimate effect is always that of the whole quantity of venom injected into the body and left undestroyed in the wound, and therefore certain to be eventually absorbed by the tissues; for the portion of venom first absorbed does not in any appreciable degree lose its effect as time goes on, nor is it quickly eliminated, but continues its poisonous action upon the system after the remainder of the venom becomes gradually absorbed and actively poisonous, and thus the effect increases or accumulates as the absorption progresses.

It has been estimated that the average amount of venom injected by a full-sized cobra is not more than what would equal 10 lethal doses for a man. Further, in many cases, the full dose will not actually be injected into the human tissues, for various reasons, such as the hindrance afforded by clothing, &c.

The plan now proposed is (after first ligaturing the limb by means of a strip of bandaging or other material tied loosely around it, and then twisted up tightly with a stick) to make a free opening into the site of the bite, deep enough to reach to the lowest point reached by the snake (half an inch should always be sufficient), and to rub in crystals of permanganate of potash. The punctures made by the fangs should be freely cut into, and the permanganate introduced and well rubbed round (being wetted with a few drops of water or even saliva), until the exposed tissues present a uniformly blackened appearance; or, alternatively, a solution in water of the permanganate (made, say, 1 in 10 in strength) could be used as a hypodermic injection into the punctures.

Sir L. Brunton has designed a suitable instrument for use, which can be carried in the pocket. It consists of a lancet-shaped blade, about half an inch long (long enough, in fact, to reach to the deepest point of a bite by the largest snake). This is set in a wooden handle, about $1\frac{1}{2}$ inches long, which is hollowed out at the other end so as to form a receptacle to hold the permanganate. Two wooden caps are fitted on the ends, one to protect the lancet, and the other to keep in the permanganate.



It is to be noted that this treatment is directed solely against the actual unabsorbed venom in the wound. The subsequent treatment, by strychnine, alcohol, or otherwise, of any symptoms of snake-poisoning which may arise is not interfered with.

N.B.—Never let it be forgotten to loosen the ligature for a few minutes half an hour or so after it has been put on, as otherwise gangrene of the limb may cause its loss, if no worse happens.

Following is a case in point:—

Last week a lad named Chas. Heddle, in the employ of Mr. J. Gill, of Glenboughton, was bitten by a black snake (says the *Cairns Post*). Mr. Hill scarified the punctures, sucked the poison, rubbed in vinegar, afterwards permanganate of potash. After an internal application of whisky, young Heddle pronounced himself to be all right, and proved it by trying to go out and look for the reptile that bit him, with a view of revenge. Mr. Hill states that an immediate application of vinegar and permanganate of potash is a splendid remedy for snake-bite. Both liquids should be rubbed into the cuts made near the punctures.

SNAKE-BITE AND ITS TREATMENT.

[From the *Queensland Government Mining Journal.*]

A correspondent has written suggesting that, in the interests of miners, some information should be given in the *Journal* concerning snake-bites and the best known methods of treating them. It is an undoubted fact that men engaged in mining and in prospecting run great risk from snakes, both on the surface and in abandoned shafts, which often have to be reopened; and, as such men are generally far removed from medical aid, it is well that they should know the best thing to do when anyone is bitten, and that the means to be adopted should be as clearly and widely made known as possible. Unfortunately, as far as internal remedies are concerned, investigations by competent authorities go to prove, as will be more fully explained later on, that to be armed with a reliable antidote is not nearly such a simple matter as the correspondent mentioned seems to think. He has been informed that the

poison of the deaf adder acts on the nerves, while that of the black, brown, and other venomous snake acts on the blood; and suggests that the miner be made familiar with a specific for each class of bite of such a nature that he could be provided with it, and ready for any emergency. Dr. A. Muller, however, in his work on "Snake Poison: Its Action and Its Antidote," came to the conclusion, after full investigation and experiment, that all snake venom is a nerve poison; but Professor Martin, who, when in Australia, also made a study of the subject, seems to draw some distinction, inasmuch as he refers to the futility of the generally accepted remedies to prevent the clotting of blood caused by all Australian snake poisons except that of the deaf adder. Dr. Muller advocated the strychnine cure as a remedy in all cases of snake-bite; but, as he admits that it may be necessary at some stage of the treatment to administer strychnine in doses which, in the absence of the snake poison, would be fatal, it will be seen how dangerous it might be to try such a remedy without professional aid, even if later investigations had not considerably discredited—as indeed they have—this form of remedy. As to having the right antidote available, it is true that anti-venomous serum has been mentioned in this connection, but, as one must apply the right antidote to the right snake, this remedy is hardly practical under ordinary conditions.

How to Distinguish Non-venomous from Venomous Snakes.

In cases of snake-bite, it is, of course, very important to determine whether the reptile inflicting the injury is venomous or not. Many persons have undergone much pain and often risk from heroic treatment for bites which they have supposed to be those of venomous snakes, but which a knowledge of the external characters of the different species would have shown to have been perfectly harmless. Indeed, it is believed that not a few persons bitten by harmless snakes have been killed either by fright or the treatment to which they have been subjected; while many records of recovery under certain treatment are unreliable on account of the doubt existing as to whether the reptiles inflicting the bites were really venomous.

As a matter of fact, far more of the Australian snakes are non-venomous than is generally supposed. The late Dr. Krefft, for many years Curator of the Australian Museum, Sydney, and a recognised authority on Australian snakes, describes twenty-one innocuous and forty-two venomous snakes of this country; but of the latter, he says, not more than five species are dangerous to man or the larger animals, and these retire underground for nearly five months of the year. The four Queensland snakes which are mostly to be dreaded are the deaf adder, the black snake, the brown snake, and the tiger snake. To the miner, prospector, and ordinary bushman, many opportunities are afforded of examining dead snakes; and, with a little observation and study, he might soon be able to tell at a glance the poisonous from the harmless species.

In the first place, on opening the mouth of a non-venomous snake, a row of small teeth will be seen along each jaw, and when such a snake bites he leaves two rows of small punctures, thus— . . . . In the venomous snake, these small teeth are rudimentary, and leave no marks; but towards the outer edge of the upper jaw there are two fangs, and the punctures left by the bite from these are two in number, thus— . . These fangs, which are the means by which the poison is conveyed from the snake to the person bitten, are not always in a state of projection, and it may be necessary to press the gum down with a stick or penknife before they can be seen; but this should be done with caution, and when it is certain the snake is dead. Sometimes, however, the punctures are not sufficiently distinct for them to be accepted as a reliable guide; but where the snake is seen there are other characteristics which will assist in the identification. According to Dr. Krefft, the gape of

the mouth of the non-venomous Australian snake is usually curved upwards; while in the venomous it forms a straight line. Again, an important distinction is to be found in the labial (lip) scales. Dr. Krefft says that of the labials there

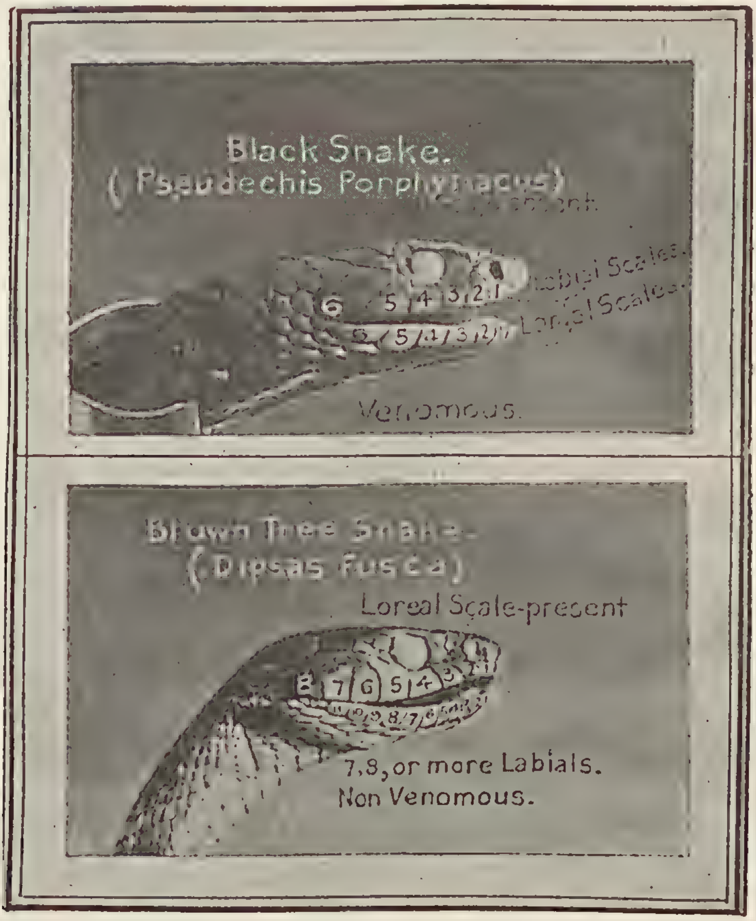


Fig. 1.—Heads of Venomous and Non-venomous Snakes.

are seven or more in non-venomous snakes, while in the venomous "there are generally only six (we may say always six—never more)." He adds that "it may safely be asserted that by these shields alone can the harmless or venomous character of snakes be ascertained. This rule does not apply to sea snakes, nor to blind snakes of the family *Typhlopidæ*, but to Australian venomous and innocuous colubrine snakes only." Another distinctive mark is that in the non-venomous snake there is a loreal scale, which is absent in nearly all Australian snakes. This loreal scale is a supplementary scale which, in the non-venomous snake, is to be found on the cheek between a labial scale below and a frontal scale above, and between the ocular and nasal scales. In the venomous snake these four scales—the labial, frontal, ocular, and nasal—all unite at one point, and are not separated from each other, as in the harmless snake, by the loreal scale.

The head and mouth characteristics which distinguish the two classes of reptiles can be seen at a glance from the accompanying reproduction of excellent photographs (Fig. 1) taken from Nature by Dr. John Thomson, of Brisbane, who is a keen student of this subject, and who kindly placed his pictures and other useful information readily at our disposal for the purposes of this article.

Dr. Thomson also has in his possession a diagram (in the shape of Fig. 2) showing, in such a way that "he who runs may read," the chief distinguishing features between the venomous and harmless snake. This diagram, which was originally prepared to illustrate a lecture, should be cut out, and kept by persons in the bush in some place where it may be readily and often seen, so that its points may bcome impressed on the mind.

TO DISTINGUISH VENOMOUS FROM NON-VENOMOUS SNAKES BY HEAD CHARACTERISTICS (KREFFT).

Venomous.	*Non-venomous.*
GAPE OF MOUTH, STRAIGHT	GAPE OF MOUTH, CURVED UPWARDS
LABIAL SCALES, SIX	LABIAL SCALES, SEVEN OR MORE
LOREAL SCALES, ABSENT	LOREAL SCALES, PRESENT
BITE MARKS • •	BITE MARKS ⋮ ⋮

FIG. 2.

Dr. Krefft states that an Australian snake that is not thicker than a man's little finger, whatever may be its length, cannot by its bite endanger the life of an adult human being. It may be added that the true *fresh*water snake is always harmless, while the saltwater or sea snakes are always poisonous. Few of the tree snakes are venomous; while the carpet snake and the so-called "green snakes" are innocuous. Very often a thick woollen sock or stocking will prevent injury from the bite of a snake, as the fang may not penetrate sufficiently far for the poison which passes down its groove to be injected beneath the skin. There is a very widely accepted belief that the deaf adder inflicts injury by a *sting* from its tail, but this is not the case.

The general symptoms exhibited by persons bitten by a venomous snake are: Great anxiety, depression and prostration, feeble and intermitting pulse, profuse cold sweats, vomiting, hurried respiration, indistinct speech, dilation of the pupil of the eye, drowsiness, and finally, in fatal cases, unconsciousness and convulsions.

TREATMENT OF SNAKE-BITE.

Professor Martin, late of the Melbourne University, who some time ago was appointed Director of the Lister School of Preventive Medicine in London, before leaving Melbourne, delivered a lecture embodying the results of several years of research into Australian snake poisons. The results of his investigations are somewhat disappointing as far as the generally accepted remedies are concerned. He says that for all snakes except the deaf adder the only remedy that is of the slightest use is the ligature, applied immediately. He adds:—

"If the bite be on the tip of the finger, the ligature may be tied round the base of the finger, if done instantly. If not, we must go higher. It is no use tying anything round the wrist or forearm, nor round the leg below the knee, for in these places the limb consists of two bones, and the circulation cannot be stopped by a band of any sort. We must go above the elbow or above the knee, where there is only a single bone. The ligature must be tied as tight as possible—twisted tight with a stick—for no blood must pass. In half an hour's time the ligature may be removed.

"All the usual remedies, such as ammonia, strychnine, and chloride of lime injections, whisky, and exercise, are powerless to check the clotting of blood caused by all Australian snake poisons, except the deaf adder. Cutting out the piece and gashing the limb to make it bleed is equally futile. Antivenomous serum is a remedy, but hardly a practical one, as you must apply the right antidote to the right snake."

Other authorities do not go so far as Professor Martin with regard to scarifying the wound and administering stimulants, and, so far as they are not likely to be injurious, these means will probably continue to be followed as extra precautions. Dr. J. Ashburton Thompson, Chief Medical Officer of the Government Health Department of New South Wales, has issued specific directions for snake-bite treatment. He first advises the use of the ligature, which is to be loosened for five minutes after the first half-hour; then tied and screwed up again. At the end of the second half-hour the ligature may be removed altogether. Dr. Thompson, in continuing his directions, says:—"In places where a ligature cannot be tied, as on the neck or face, pinch up the bitten part between the finger and thumb, and cut it out. In any case the bitten part should be cut into by numerous little cuts over and around the bite, for about $1\frac{1}{2}$ inches round, and sucked by the mouth freely and perseveringly; and this can be done without danger by any person. Stimulants, such as brandy, whisky, gin, rum, in small quantities at a time (a few teaspoonfuls), or strong tea or coffee or wine, may be given if the patient be faint."

The removal of the ligature as described is a very necessary precaution, for at least one case has occurred in Queensland where, through keeping it on too long, mortification set in, and amputation of the arm had to be resorted to.

Professor Krefft, in his work previously referred to, says:—"The whole treatment resolves itself into this: *Suck the wound, if possible, at once; apply a ligature; lacerate the punctures, and wash the part with water or urine; keep moving, and do not despond.* Half the number of fatal cases have resulted from fear, many persons having died simply because they lost heart, did not attempt to tie a ligature, or were afraid to lacerate the wound and suck it."

A Croydon paper some time ago published particulars of a case in which a cure had been effected by rubbing vinegar into the wound; but in this case the ligature was first applied and the wound scarified. The vinegar was used in consequence of the person treating the patient having seen an extract in the *Queensland Agricultural Journal* from an Indian paper, which described experiments successfully made with it on animals which had been bitten by snakes.

Mr. John Wilson, Brisbane, says that in Ceylon he was very successful in saving the lives of coolies who were bitten by cobras or tic-polongas when picking coffee. As soon as a man was bitten, a ligature was put on above the wound, then a pin was pushed through the skin, a piece of twine was twisted round the projecting part of the pin and drawn tight. This raised the bitten part, which was cut off with a sharp knife.

The vinegar cure is described in the *Queensland Agricultural Journal* in the issues of January, 1903, January, 1904, and February, 1905. Three authenticated cases of cure of snake-bite by the vinegar treatment have been reported to us since the first article appeared in the *Journal*.—Ed. *Q.A.J.*

ROAD-MAKING.

Last month, when reporting on a line of country where the residents wish for a railway, the Queensland Railway Commissioner stated that at certain seasons of the year the whole country traffic comes to a standstill. Now, this occurs on our blacksoil plains, not only in flood time, but after continued heavy rains, and we have heard it said that it is no use trying to form roads in some of our richest agricultural districts on the Darling Downs, because, if the crust is once broken, metal would be swallowed up wholesale. But is there no other method of road-making in such districts, except by laying down hundreds of tons of metal to be swallowed up by the deep alluvial soil? Fascines have been employed with great success in such localities, and form a solid lasting road. Fascine roads have been successfully carried across swamps, and it is matter of history how a railway was built across the bottomless Chatmoss in England.

Here, however, is a method of road construction which should commend itself to shire councils in such districts as those above mentioned. It was the subject of a paper by Mr. Stillwell H. Townsend, in the report of the New Jersey Commissioners of Highways. The chief trouble is, that the road must possess the rather opposing characteristics of lightness and strength—lightness in order that it may not sink into the soft ground on which it is laid, and strength that it may resist the wash of water which may occasionally flood it in a time of floods. Naturally, the two qualifications are not always easy to obtain, and the experience of men well versed in the subject is valuable.

Mr. Townsend says:—One of the roads described is situated close to Cape May, at the mouth of the Delaware River, and runs from Rio Grande to Holly Beach. As a means of securing a foundation for the road, large gum trees, with two opposite sides flattened, were laid lengthwise, one being placed in the centre and one on each side of the road, the outside ones being placed about under where the wheels would pass. Poles about 3 inches in diameter at the small end were laid across these, the space between the stringers having been first filled with mud. At each side, over the ends of the poles, 2 inches by 6 inches curb planks were placed, which were securely fastened, edge up, to cedar piles driven 6 feet into the meadow, and projecting 4 feet above the planks. The piles were placed 8 feet on each side of the centre line, thus giving a 16-feet roadway. Against the outside of the planks a mud bank was carefully thrown up and compacted. The meadow grass grows through this, and helps to secure it. On the inside of the planks a line of mud about 2 feet wide was placed and compacted, by which means an almost watertight trough was formed. Upland soil was then filled into the remaining space between the curb planks, and was brought level with their tops. Over this soil oyster shells were placed, three bushels going to the square yard. Over the shells, before they became ground up, a coat of good gravel was spread. This form of construction gave an elevation of about 14 inches above the highest meadow passed over, and was above the tides, except during severe north-east storms. The road has several times been topped by these storm-tides, but has withstood them perfectly.—[This road was built over low, swampy marsh land on the sea coast.—Ed. *Q.A.J.*]

EXTERMINATION OF RABBITS.

The pastoralists of New South Wales are evidently much impressed with the value of the Parisian Dr. Danysz's proposed method of rabbit destruction. It will be remembered that the doctor offered to come to Australia and demonstrate the efficacy of his remedy, in consideration of the payment of a reasonable sum of money. The offer was not accepted, but during November last we learn from the *Pastoralists' Review* that a deputation—comprising representatives of the New South Wales Pastures Boards' Council of Advice, consisting of Messrs. W. Alison (chairman), R. T. Keys, F. A. Mackenzie, and others, with Mr. C. Binnie, of the Stockowners' Association—waited upon the Premier, Mr. J. H. Carruthers, and the Minister for Lands, Mr. Ashton, *re* a disease for the extermination of rabbits.

It was stated that the stockowners were so desirous of having experiments made with a view to the extermination of the rabbit that they were prepared, if the Government would grant them permission, to bear the whole of the expenses of bringing out Dr. Danysz from Paris for the purpose of allowing him to experiment with his diseases in New South Wales. Two stockowners had signified their willingness to allow the experiment to be carried out on their runs, leaving their sheep, cattle, horses, &c., thereon whilst the experiment was being made. Of course, they understood that the whole thing would be under Government supervision, and that any experiment would have to be carried out under certain conditions. They had it from Dr. Danysz himself that

the disease would attack the rabbits in the lungs and throat, and the contagion would come by a mucus from the nostrils that would foul the burrows and the food. The disease would be highly contagious, and the course of it would run from three days to six weeks, and any rabbit taking it would be almost sure to die, and it would be harmless to man, beast, or bird.

The Premier expressed himself as being in sympathy with the proposal, and, as the deputation agreed to shoulder all the expenses connected with the visit, he would say, "Fire away." If they would come forward with a business-like proposal, the Government would endorse that proposal every time.

In consequence of the interview with the Premier, the Council of Advice held a meeting the next morning, and a proposal was forwarded to the Minister as follows:—

"That the boards of New South Wales and the stockowners of Australia would find all the money for the experiments from beginning to end, under the supervision of anybody the Government chose to appoint, and with any safeguard the Government might desire to impose. That it was further considered by the council whether preliminary experiments should not be made at Montague Island or some other site or run which would be submitted to the Government for their approval. On Montague Island the rabbits have existed for some considerable time, and are in their natural state. This island is situated about 7 miles from the coast, and is of considerable acreage, and the preliminary experiments might well be tried there. On receipt of a reply, steps would be immediately taken to collect the money. That the council of advice would submit the name of the bacteriologist who was chosen by them for the approval of the Government."

Promises of money for this important experiment have been received from many private individuals, and from several stock boards in New South Wales.

BURNING OUT STUMPS.

We have on several occasions described the method of burning out stumps and large trees by means of saltpetre. Lately, also, several farmers have sought for further information on the subject. The process is very simple, and we have seen the excellent results on two farms on the Blackall Range. A Canadian paper thus describes the method:—

In treating with saltpetre, we bore from one to three holes with a sharp 2-inch auger, according to size of stump. If a moderate-sized stump, one hole in the centre of stump is sufficient, or if the stump is very large bore two or three holes in different sections. If at an angle to the grain they will bore much easier than straight down from the top. In each hole place 1 oz. of saltpetre, and fill each hole with rain water and plug closely with wood. The water will dissolve the saltpetre and carry it to all portions of the stump, opening up the grain pores. As soon as the water is absorbed, which will be in from four to six weeks in dead stumps and somewhat longer in green ones, uncork and fill the holes with kerosene oil, and again cork tightly. As soon as the oil has been absorbed, which will be in a few days, possibly a week, the stump is ready to fire. We always manage to have a few small stumps or old litter to start a fire. After the fire is started, it is not much trouble to get rid of the stump. We have had a large oak stump, 5 or 6 feet in diameter, burn entirely away, root and crown. The dry weather of autumn is the best time to burn them out, as the soil about the roots holds but little moisture then to retard burning. During the summer and autumn of 1892 we burned out a number of large oak stumps in this manner. A number of them were green, but we treated them to two applications of coal oil before firing them; however, they took a great deal of chunking to get them out of the way of the binder and plough.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table Showing the Total Rainfall for each Month of the Year in the Agricultural Districts of Queensland.

Stations.	1904.			1905.									
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
North.													
Bowen	1·66	0·16	4·33	22·69	0·50	1·17	5·72	0·74	0·53	0·39	0·06	4·03	0·05
Cairns	0·37	0·42	7·88	25·74	8·59	6·81	6·92	3·89	1·94	0·43	2·27	Nil	0·46
Geraldton	2·49	1·18	7·35	28·37	5 71	8·26	20·51	13·35	9 39	2·41	3·88	Nil	0·22
Herberton	0·62	1·15	2·06	7·39	3·37	0·75	2·41	2·67	1·17	0·05	0·89	Nil	0·21
Hughenden	4·10	1·76	0·28	3·37	0·07	0·70	3·84	Nil	0·41	0·47	Nil	*	*
Kamerunga	1·00	0·43	11·62	29·08	7·56	4·38	8·89	5·63	2·59	1·11	2·16	Nil	0·63
Longreach	4·66	0·72	1·34	1·17	0·53	0·17	2·41	Nil	Nil	0·22	Nil	Nil	0·06
Lucinda	1·90	0·50	2·10	15·40	1·68	2·79	23·06	3·15	1·92	4·14	0·89	0·15	0·68
Mackay	8·07	Nil	1·52	29 89	4 73	3·67	13·19	2·17	1·82	0·95	0·66	0·97	0·08
Rockhampton	1·36	1·32	1·60	15·39	0·92	0·09	8·93	0·95	0·54	0·26	0·51	0·70	0·91
Townsville	3·67	1·17	5·70	13·71	1·97	2·02	6·41	0·52	0·35	0·68	0·06	3·83	*
South.													
Barcaldine	3·88	1·02	6·54	1·85	0·12	0·25	1·56	Nil	Nil	0·30	0·04	Nil	0·15
Beenleigh	1·89	4·43	4·55	5·44	3·04	2·91	3·63	2·21	0·40	0·27	1·12	1·15	2·82
Biggenden	4·06	1·08	5·89	13 05	1·94	3·61	3·81	1·46	0·60	0·28	0·10	0·79	2·56
Blackall	4·99	0·53	5·04	3·19	0·23	2·34	5·02	0·21	Nil	0·68	0·04	Nil	0·29
Brisbane	1·28	2·36	3·65	9 09	2·64	2 65	4·50	1·10	0·39	0·28	0·65	1·32	2·22
Bundaberg	3 32	0·16	5·16	16·67	2·17	3·35	6·31	4·26	1·10	0·71	0·17	0 95	2·37
Caboolture	2·42	3·07	7·36	8·10	3 43	3·57	4·89	1·65	0·26	0·05	0·36	0·98	2·73
Charleville	3·14	0·09	2·51	1·70	0·73	1·67	3·87	0·63	0·01	0·15	0·14	0·09	0·99
Dalby	1·07	2·59	2 15	3·40	0·74	5·46	3·09	2·19	0·25	1·15	0·76	0·14	2·09
Emerald	1·44	2·43	2 44	7·77	0·25	1·76	6·00	0·72	0·06	0·50	0·30	0·29	0·64
Esk	2·90	2·90	3·07	8·26	0·85	1·87	3·52	1·68	0·33	0·52	0·57	0·65	3·21
Gatton College ...	1·95	1·14	2 42	5·57	1·10	1·71	4·22	2·56	0·26	0·98	0·27	0·54	2·59
Gayndah	2·49	0·67	2·36	11·34	0·82	1·58	4·06	1·07	0·42	0·54	0·25	0·30	2·38
Gindie	3·09	1·55	2·02	7·07	0·06	1·74	7·44	0·41	0·11	0·37	0·09	Nil	1·11
Goondiwindi	1·09	1·61	1·62	3·37	0·87	2·53	6·49	1·23	0·55	0·52	0·58	Nil	3·57
Gympie	4·08	2·55	3·94	9 75	2·29	2·00	7·05	4·49	0·79	0·78	0·70	1·85	1·48
Ipswich	3·20	1·62	4·25	6·87	1·30	1·85	2·86	1·98	0·50	0·44	0·78	0·70	2·91
Laidley	1·87	3·99	5·26	9 93	2·33	2·17	4·11	2·59	0 56	0·56	0·61	0·30	2·36
Maryborough	3·52	2·62	2·33	20 69	2·67	2·78	3·48	3·56	1·21	0·07	0·26	1·04	2·48
Nambour	1·62	2·08	7·54	13·50	5·38	3·58	6·65	4·79	1·36	0·05	0·83	1·62	4·70
Nerang	3·52	2·39	3·85	4 95	4·99	5·61	8·98	3·63	0·61	0·27	1·55	1·04	4·59
Roma	1·43	0 03	1·76	2·65	1·74	1·44	2·92	1·72	0·21	0·35	0·31	0·15	1·02
Stanthorpe	3·98	1·92	5·00	3 04	0·37	5·29	2·64	1·63	1·01	0·63	1·77	0·28	3·48
Tambo	3·31	0 80	3·90	3·54	1·34	2·54	5·12	0·12	0·06	0·36	0·46	Nil	0·85
Taroom	2·42	1·73	2·92	3·25	1·63	2·73	6·17	2·22	0·33	0·67	0·31	Nil	0·76
Tewantin	1·09	1·93	7·61	11·79	2·91	3·64	12·43	10·01	2·06	0·22	0·55	1·29	6·57
Texas	1·63	0·76	2·97	3·77	0·09	2·47	3·78	3·07	0·80	0·53	1·09	0·16	3·54
Toowoomba	1·61	2·26	2·75	4·50	1·91	4·17	5·27	3·69	0·65	1·01	0·66	0·61	2·59
Warwick	2·89	1·92	3·65	1·52	1·28	6·20	2·06	2·18	0·77	0·26	1·01	0·41	4·00
Westbrook	4·85	3·37	3·65	2·46	0·57	2·00	1·24	2·54	0·46	0·71	0·61	1·23	2·60

* Return not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

Butter.—Australian : Victorian, 102s. to 112s. ; New South Wales, 102s. to 112s.; Queensland, 102s. to 112s. Canadian, 110s. to 114s. Danish, 124s. per cwt.

Cheese.—Canadian, 55s. to 56s. ; New Zealand, 50s. to 56s. per cwt.

Condensed Milk.—10s. to 18s. per case in 20-case lots.

Sugar (duties, raw, 2s. to 3s. 10d. per cwt. ; refined, 4s. 2d. and $\frac{1}{4}$ per cent.).—Refined, £19 to £20 ; raw, £17 to £19 per ton ; German beet, 88 per cent., 8s. per cwt.

Molasses (duty, 2s. per cwt. and $\frac{1}{4}$ per cent.).—8s. to 12s. per cwt.

Rice.—Real Carolina, £24 to £28 ; Rangoon, £8 to £12 ; Japan, £13 to £17 (crop failed) ; Java, £17 to £20 ; Patna, £16 to £17 per ton.

Coffee (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 50s. to 125s.; peaberry, 70s. to 120s.; Santos, 42s. to 56s.; Jamaica, 110s. to 130s. per cwt.

Chicory Root, Dried (duty paid).—25s. to 26s. per cwt.

Arrowroot.—St. Vincent, 1⅝d. to 3½d.; Natal, 3d. to 5d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

Wheat.—Duluth, 34s. to 35s. per 496 lb.; English, 27s. to 31s. per 504 lb.; South Australian, 33s. 6d. to 33s. 9d.; Queensland, 33s. 3d. to 33s. 9d. per 480 lb.

Flour.—Australian, 23s. to 23s 6d. per 280 lb.

Malting Barley.—31s. 3d. to 33s. 3d. per 448 lb.; grinding, 28s. to 29s. per 416 lb.

Oats.—New Zealand, 21s. to 23s.; Australian, 20s. to 22s. per 384 lb.

Split Peas.—39s. 6d. to 42s. per 504 lb.

Ginger.—Jamaica, 43s. to 75s.; Cochin, 45s. to 70s.; Japan, 16s. to 17s. per cwt.

Vanilla.—7½ to 8½ in., 6s. to 11s.; 7 to 7½ in., 4s. to 8s. 6d.; 3 to 6 in., 3s. to 5s.; splits, 3s. to 5s. per lb.

Pepper.—Capsicums, 14s. to 60s.; chillies, 37s. to 45s. to 50s. per cwt.; black, 5½d.; white, 8d. per lb.

Rubber.—3s. 10d. to 5s. 4d.; Ceylon biscuits, 6s. 4d. per lb.

Green Fruit.—Australian: Apples, no quotation; bananas, 6s. 6d. to 11s. per bunch; pineapples, 2s. 6d. to 5s. each. Oranges, no quotation.

Dates.—Tafilat, none; Egyptian, none; Persian, 11s. to 13s. 6d. per case.

Cotton.—Uplands, 5d. to 6½d.; Sea Island, 16d. per lb.

Cotton Seed.—£5 6s. 3d. to £5 10s. per ton.

Cotton-seed Oil.—Crude, £14 15s.; refined, £17 15s. per ton.

Cotton-seed Oil Cake.—Decorticated, £6 15s. to £7; undecorticated, £4 11s. to £4 12s. 6d. per ton.

Cotton Waste.—In 5-cwt. bag bales, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

Linseed.—26s. to 26s. 3d. per 416 lb.

Linseed Oil.—£16 5s. to £16 10s. per ton.

Linseed Oil Cake.—£7 8s. 9d. to £8 per ton.

Olive Oil.—£36 to £40 per tun (252 gallons).

Copra (cocoanut-kernel).—£16 5s to £17 per ton; £8 to £9 per ton at the S.S. Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

Beeswax.—Australian, £6 12s. to £7 per cwt.

Lucerne Seed.—60s. to 68s. per cwt.

Canary Seed.—68s. to 100s. per quarter of 480 lb. = 8s. 6d. to 12s. 6d. per bushel.

Honey.—17s. to 26s. 6d. per cwt.

Ramie Fibre.—£33 18s. 9d. to £38 3s. 9d. per ton.

Manila Hemp.—£40 to £40 7s. per ton.

Sisal Hemp.—Influenced by the rapid rise of Manila hemp, the price of sisal fibre has advanced to £30 16s. to £39 9s. per ton for good.

Mauritius Hemp (Fourcroya Fibre).—£31 7s. 10d. to £33 1s. 10d. per ton for mixed.

New Zealand Hemp.—£31 to £31 17s. 3d. per ton.

Flax.—£48 to £52 per ton.

Tapioca (duty, 5d. per cwt.).—1½d. to 2d. per lb.; pearl, 13s. to 16s. per cwt.

Eggs.—French, 11s. 6d. to 12s.; Danish, 8s. 6d. to 11s. per 120.

Bacon.—Irish, 62s. to 66s.; American, 46s. to 52s.; Canadian, 54s. to 60s. per cwt.

Hams.—Irish, 80s. to 108s.; American, 45s. to 62s. per cwt.

Tallow.—Mutton, fine, 34s.; medium, 28s.; beef, fine, 30s. 6d.; medium, 27s. per cwt.

POULTRY (Smithfield).—Supplies larger; quieter demand. Fowls: Yorkshire, 2s. 6d. to 2s. 9d.; Essex, 2s. 6d. to 3s.; Boston, 2s. to 2s. 6d.; Surrey, 2s. 9d. to 3s. 6d.; Sussex, 2s. 6d. to 3s.; Welsh, 2s. to 2s. 3d.; Irish, 1s. 8d. to 1s. 10d.; geese, 5s. to 6s.; Aylesbury ducks, 2s. 3d. to 2s. 9d.; country, 2s. to 2s. 6d.; quail, 1s. to 1s. 6d; Bordeaux pigeons, 9d. to 11d.; feathered, 7d. to 9d.; rabbits, 8d. to 11d. each; Australian, 6s. 3d. to 8s. 6d. per dozen; hares, 2s. to 2s. 6d.; leverets, 1s. 4d. to 1s. 9d. each.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	Nov. 18.	Nov. 25.
New Zealand Sheep. (Crossbred Wethers and Merino Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$3\frac{3}{4}$d.	$3\frac{7}{8}$d.
Canterbury, medium (56 lb. to 64 lb.)	$3\frac{3}{4}$d.	$3\frac{7}{8}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$3\frac{5}{8}$d.	$3\frac{3}{4}$d.
Dunedin and Southland (56 lb. to 64 lb.)	$3\frac{3}{4}$d.	$3\frac{13}{16}$d.
North Island (56 lb. to 65 lb.), ordinary	$3\frac{5}{8}$d.	$3\frac{3}{4}$d.
North Island, best	$3\frac{3}{4}$d.	$3\frac{13}{16}$d.
Australian Sheep. (Crossbred and Merino Ewes.)		
Heavy (over 50 lb.)	$2\frac{15}{16}$d.	$2\frac{15}{16}$d.
Light (under 50 lb.)	$3\frac{1}{16}$d.	$3\frac{1}{16}$d.
River Plate Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	3d.	3d.
Light (under 50 lb.)	$3\frac{3}{16}$d.	$3\frac{5}{16}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	$4\frac{3}{16}$d.	$4\frac{3}{16}$d.
Canterbury, heavy (36 lb. to 42 lb.)	4d.	4d.
Dunedin and Southland (28 lb. to 42 lb.)	None offering.	
North Island (28 lb. to 42 lb.) ...	None offering.	
Australian Lambs.		
30 lb. to 40 lb., first quality ...	4d.	4d.
30 lb. to 40 lb., second quality ...	$3\frac{3}{4}$d.	$3\frac{3}{4}$d.
River Plate Lambs.		
30 lb. to 40 lb.	None offering.	
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{3}{4}$d.	$2\frac{13}{16}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{3}{8}$d.	$3\frac{3}{8}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (160 lb. to 220 lb.) ...	None offering.	
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{3}{8}$d.	$2\frac{3}{4}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{15}{16}$d.	3d.

QUEENSLAND TIMBER.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the English market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand. Ivory wood should be carefully preserved from destruction.

General Notes.

COB CORN COMPETITION.

The competition for the prizes offered by the Queensland National Agricultural and Industrial Association, for the best 10 cobs of yellow maize planted and attended to by children or farmers' employees under seventeen years of age, appears to be attracting very much attention. We have received from the acting secretary of the association the conditions under which the corn is to be raised, and we publish them so that the information may be as widely disseminated as possible. The conditions are as follow:—

Numerous prizes will be offered for the best 10 cobs yellow maize, to be planted and attended to by the exhibitor. Certificates will be required as to the *bona fides* of exhibitors, declaration to be made before a justice of peace.

Special packets of best procurable maize will be supplied gratis by the National Association. Messrs. Charles Taylor and Co., seedsmen and plant merchants, Roma street, Brisbane, have kindly offered to select and supply same. It is considered desirable that the cobs grown from this seed should be shown, but, if satisfactory explanation is made as to the reason why other cobs are shown, they can be accepted.

On application to the secretary of the National Agricultural Association, *Courier* Building, Brisbane, the packets of seed will be forwarded.

Competition for Queensland growers only.

Information as to description of cultivation, rainfall, and whether irrigated to be supplied.

Exhibits must be shown first at the National Show, Brisbane.

The same district boundaries as contained in the District Societies' Competition to be observed.

Prizes given for the best exhibits from each district. The first prizewinners from each district will then be judged collectively for the championship, and, if required, the championship exhibits are to be shelled and weighed.

The rules and regulations issued by the Council of the National Agricultural and Industrial Association governing this competition will be strictly adhered to.

At the St. Louis Exposition, U.S.A., held last year, 1,250 farmers' boys of Illinois State took part, the photo. of exhibitor being placed along with the corn.

Mr. R. A. Ruddle, photographer, of the Valley, Brisbane, has generously offered to photograph each competitor exhibiting at the Brisbane Show. Such photos. can be shown as part of the exhibit, but are not absolutely necessary. All exhibits will become the property of the National Association.

Memo.—Up to 25th November, 522 packets have been applied for. The National Association solicit donations towards prize money.

Early intimation is herein forwarded you with the hope that a very large number of your members may be informed prior to planting their maize, and that the result may be the receipt of numerous entries from your district. Kindly ask local Press to mention the Cob Corn Competition in their news columns.

A LOST ORCHID REDISCOVERED.

Every horticulturist in general and orchidist in particular, all the world over, will be interested to learn that the "lost orchid," *Cypripedium fairrieanum*, has been rediscovered. The discoverer is a European, an Englishman; and he, with Mr. S. P. Chatterji, the well-known florist and nurseryman of Calcutta, have the secret of its natural habitat between them.

They have a fine stock of plants, and will doubtless make the most of them in due course. They will now claim the reward of £2,000, says *Indian Gardening,* offered by a certain London firm of plant merchants to anyone who would rediscover the "lost orchid." The locality where this orchid was found remains a profound secret for the present, but suffice it to say that it was *not* found in the Garo Hills, its supposed natural habitat. There is no doubt at all as to the identity of the plant, as it has been submitted to Dr. Prain, Superintendent of the Royal Botanic Gardens, Calcutta. This is probably the most important and sensational announcement that the horticultural and botanical world has received for many years. The plant was lost to the world in 1876, and may be said to be practically extinct in Europe at the present time.—*The Garden.*

THE BOTTLING OF FRUIT.

A useful leaflet on this subject has been issued by the University of Leeds and the Yorkshire Council for Agricultural Education. The bottle recommended is known as the English Atlas, a wide-mouthed bottle, with a flat indiarubber ring on the neck, upon which a metal lid is tightly secured. It is sold in various sizes at 4d. for a 1-lb. bottle, 4¾d. for one to hold 2 lb., and 6½d. for one to hold 3 lb. Sound fruit, not over-ripe, should be chosen, and packed firmly in the bottle to within an inch of the top. In the case of soft fruit, the bottom of the bottle should be slapped with the hand to ensure firm packing, while such fruit as plums should be arranged by means of the handle of a wooden spoon. Clear, cold water should be poured into the packed bottle until the fruit is covered, leaving an air space of ½-inch over it. Then the lid should be screwed tightly on to the rubber ring, the bottles being next stood up loosely in a boiler of cold water, allowing the temperature to rise gradually to 160 degrees Fahr., which will take about 1½ hours. Then the fire should be removed, so that the fruit will cool gradually. When cold it can be removed to a cool, dry place, standing the bottles upright.

STRAWBERRIES UNDER CLOTH.

The *South African Farmers' Advocate,* Orange River Colony, says that growing strawberries under thin muslin, known as tobacco-plant bedcloth, results in later blooming, larger berries, better pollination, and healthier plants. This practice adds 50 to 100 per cent. to the yield of berries. The same journal also gives

AN IDEA IN MOWING.

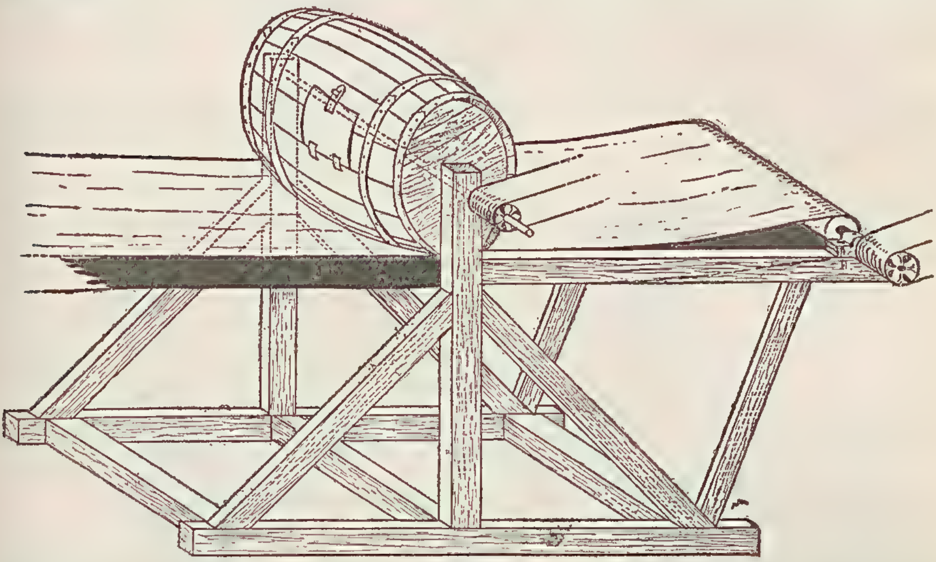
Do not, in mowing or reaping, go round and round a square field, on the assumption that to split it would increase the turning. The number of rounds will be exactly the same in either case; but, by making two strips, you save the inconvenience of so many short turns at the last. The long strip has an advantage also in enabling you to circle around the end instead of stopping to turn and cut across it. There is considerable practical advantage in dividing a square field.

CASTOR OIL AND SULPHUR FOR WHITE SCALE.

"A Constant Reader" writes to say that he has tried the above remedy for the destruction of white scale on orange-trees and mandarins. The orange-trees stood it well, and the scale was completely destroyed on the stems, although there was still some on the smaller branches. With the mandarins, however, the experiment was disastrous, as it completely destroyed them, the bark coming off wherever the mixture was applied. Will some other orange-growers give us their experience of the remedy?

A SIMPLE BARREL-CLEANER FOR GROUNDNUTS.

Enormous quantities of ground—or pea—nuts are grown in North Carolina, U.S.A., for consumption as food and for confections. A very simple and inexpensive cleaner is in use in that State. Mr. T. K. Bruner, Secretary to the North Carolina Department of Agriculture, sent to the *Tropical Agriculturist*, Ceylon, a sketch of the arrangement. We have taken the liberty of adding some supports to the barrel, which in the original sketch appeared to be floating like Mahomet's coffin—in the air. It consists of a roughly-made (inside) large barrel, which is rigged with an axle for turning; the nuts as



they come from the field, with all stems removed, are dumped into this barrel, and it is turned; the sands, the rough interior, and the nuts, by reason of this motion, create sufficient friction to clean the nuts. These are intended for food consumption, and where a good appearance is wanted. The next step is to gradually feed them from the barrel on to a moving wide canvas belt, which is long enough to seat several girls and boys on either side, who quickly pick out the discoloured nuts and leave at the discharge only the cleaned product; the rest are thrown by the sorters into the oil pile.

A NEW USE FOR SISAL FIBRE.

There are few waste substances resulting from the preparation of various raw products of the soil which have not eventually been put to good and profitable use. Means have now been found to convert the waste from the sisal fibre scutching machines, called "tow," into a valuable substance for stuffing mattresses and pillows. As most people know, cotton, cocoanut fibre, and some other fibrous substances, when used for this purpose, become in a short time flat and hard, whilst horsehair retains its elasticity under the same conditions. The *Journal d'Agriculture Tropicale*, quoting from the Amani *Pflanzer* says that this quality can be imparted to sisal and coir fibre so successfully that inferior grades and waste tow can be profitably utilised. The sisal is boiled in ten times its own weight of a solution (2 to 4 per cent.) of caustic soda, and it may be kept in this, when almost at boiling point, for one hour. Then the fibre is thoroughly washed, and when quite dry is treated with gum lac (5 parts of alcohol to 1 part lac). It is then put under pressure and dried by artificial heat, until it curls up. It is then in a condition to be employed in the stuffing of mattresses and pillows, and will retain its elasticity in the same way as horsehair.

SIMPLE COW BAIL FITTINGS.

Mr. Denyer also writes:—

Appended are illustrations of a simple and effective method of closing and opening a cow bail, which can be worked very expeditiously with one hand, or, if need be, by a cord from a distance. It also has the advantages of being compact and out of the way.

The bail is best made by putting two posts into the ground and bolting two pieces of 3-inch or 4-inch by 2-inch hardwood across top, with a 2-inch space between for a 3-inch by 2-inch hinged upright to work in. The block of hardwood which stops the hinged upright when the bail is closed is carried down below cross pieces for about 5 inches, and on to this the catch as shown

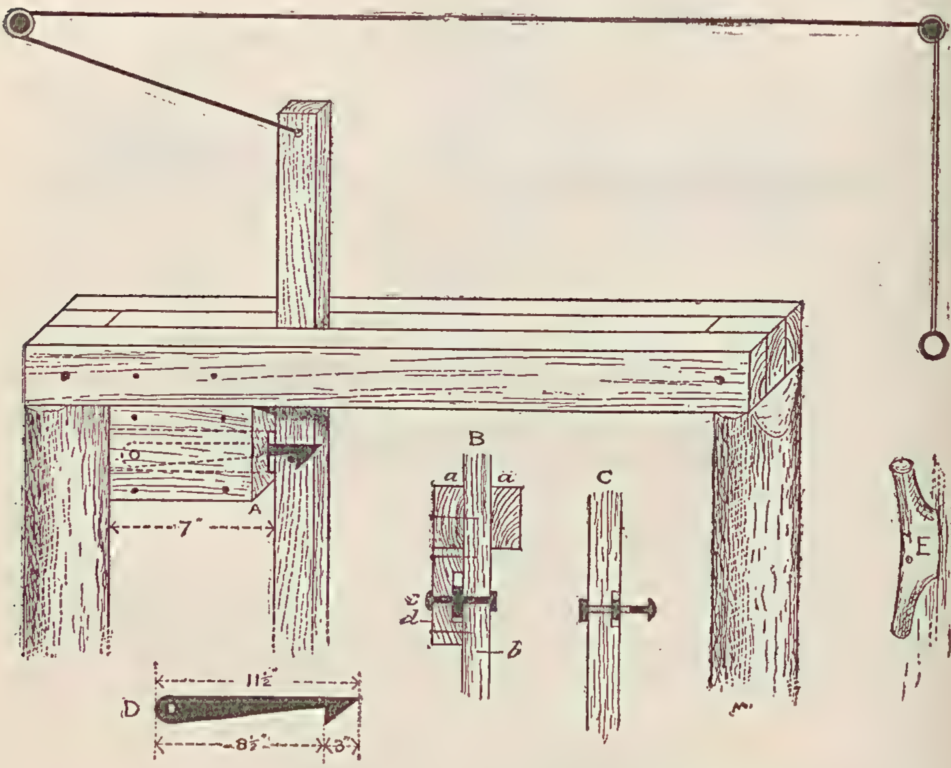


FIG. A.—Bolt in position.

FIG. B.—Section at A.
aa. Cross pieces 4 in. by 2 in.
bb. Stops hinged upright.
c. Bolt on which catch works loosely.
d. Facing block to catch.

FIG. C.—Method of fixing ½-in. bolt into upright with two nuts, one sunk flush with surface.

FIG. D.—Hole to take ⅜-in. bolt loosely.

FIG. E.—Form of wooden cleat.

and made of ⅜-inch thick flat iron (cost about 1s.) is bolted, so as to work loosely under a facing block sunk on one side to receive it. The catch drops on to a ½-inch pin or bolt projecting from the side of the hinged upright. A bolt is preferable, and is best affixed by two nuts, one of which is sunk flush with the surface of the upright, as shown sectionally.

Incidentally, it may be remarked that a cleat made of hardwood is much better and quicker for making fast and loosening the leg rope than any method of tying it, inasmuch as that no pulling or jerking upon the rope by the beast makes it difficult to quickly loosen.

HIGH PRICES FOR FIBRES.

As was to be expected after the occurrence lately of a hurricane in the Philippines, which did £1,000,000 worth of damage to the banana plantations, from which plants *(Musa textilis)* the Manila hemp is derived, a considerable rise has taken place in the prices of various fibres. From the *Journal d'Agriculture Tropicale* we take the prices (for September) quoted in our price list of articles which can be produced in Queensland. Thus Manila hemp is quoted as high as £40 7s. per ton, sisal at £39 9s., Fourcroya or Mauritius hemp at £33, New Zealand hemp at £31 17s. 3d., and Ramie at £38.

PRESERVING EGGS, Etc.

W. A. Denyer, The Dene, Stanthorpe.—

We have submitted your numerous questions to competent authorities, who furnish the following replies:—

1. *Preserving Eggs.*—There is no better preservative than water glass (silicate of soda).

2. *Planting Seasons at Stanthorpe.*—The information was given in the issue of this *Journal* for December, 1901. No copies are now available. You might, however, obtain a copy from Mr. Tyas, bookseller, Queen street, Brisbane.

3. *When is the Cow in Calf?*—If the cow is in calf, she will not seek to return to the bull. The following test was given some time ago in an American

QUEENSLAND AGRICULTURAL COLLEGE OLD BOYS' UNION.

In compliance with a request made by the members of the Queensland Agricultural College Old Boys' Union that a section of the *Journal* be made available for the publication of papers of interest by them, and notes of their meetings and proceedings, &c., the required space has been reserved especially for this purpose. The members will therefore, perhaps, feel disappointed that the gentleman who was deputed to write the first paper has found it impossible to prepare it in time for this issue, but has promised to forward it in time for the next issue of the *Journal* in February, 1906.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

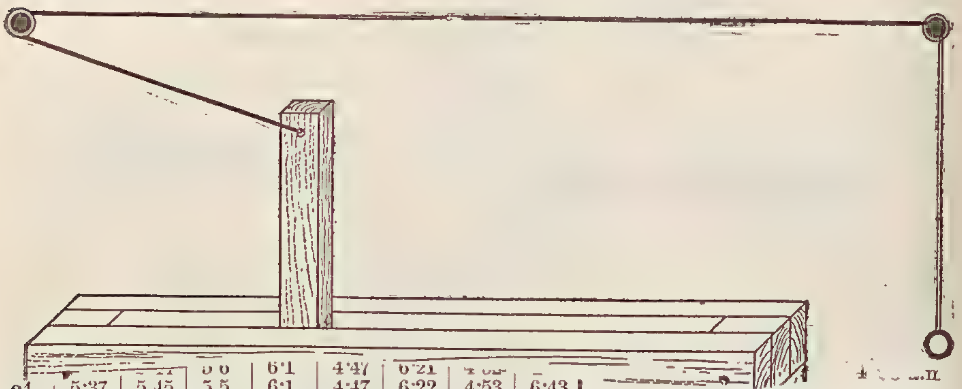
Times of Sunrise and Sunset, 1905.

Date.	September.		October.		November.		December.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·1	5·34	5·28	5·47	4 58	6·6	4·46	6·29
	[illegible]	[illegible]	5 6	6·1	4·47	6·21	[illegible]	[illegible]
24	5·37	5 45	5 5	6·1	4·47	6·22	4·53	6·43
25	5·35	5·45	5 4	6·2	4·47	6·23	4 53	6·43
26	5·34	5·45	5·3	6·2	4·46	6 24	4·54	6·44
27	5·33	5·45	5·3	6·3	4·46	6·25	4·54	6·44
28	5·32	5·46	5·2	6·3	4 46	6·26	4·55	6·44
29	5·31	5·46	5·1	6·4	4·46	6·27	4·56	6·45
30	5 30	5·46	5·0	6·4	4·46	6·27	4·56	6·45
31	...	...	4·59	6·5	...	...	4·57	6·45

PHASES OF THE MOON.

			H.	M.
6 Sept.	☾ First Quarter		2	9 p.m.
[illegible]	○ Full Moon		[illegible]	[illegible]
12 ,,	○ Full Moon		9	26 ,,
19 ,,	☽ Last Quarter		10	9 p.m.
25 ,,	● New Moon		2	4 ,,

down ... cross pieces for about 5 inches, and on to this the catch as shown



The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1905.	Rockhampton. Rise.	Rockhampton. Set.	Townsville. Rise.	Townsville. Set.	Cooktown. Rise.	Cooktown. Set.
September 1 to 22	9 m.	11 m.	24 m.	30 m.	27 m.	35 m.
,, 23 to 30	10 m.	10 m.	28 m.	26 m.	32 m.	30 m.
October ...	12 m.	8 m.	32 m.	22 m.	38 m.	24 m.
November ...	16 m.	4 m.	40 m.	14 m.	50 m.	12 m.
December ...	18 m.	2 m.	44 m.	10 m.	55 m.	7 m.

Answers to Correspondents.

QUININE.

H.W.H., Rosewood.—There appears to be no season of the year when this plant can be successfully eradicated. The plants have been grubbed over and over again by farmers in the Brisbane district, and still they thrive.

PRESERVING EGGS, Etc.

W. A. Denyer, The Dene, Stanthorpe.—

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3. *When is the Cow in Calf?*—If the cow is in calf, she will not seek to return to the bull. The following test was given some time ago in an American journal, and we give it to our correspondent for what it is worth:—"The cow to be tested is to be milked separately, and, as soon as possible after milk is drawn, dip a straw or timothy stem in the bucket of milk. Have a glass of pure water at hand, and allow one drop of milk—only one—to fall into the water. If the milk quickly dissipates and renders the water murky, she is not in calf; but, if the milk drop sinks to the bottom of the glass before mixing with the water, she is pregnant. If you are sufficiently expert, take the milk of another cow that has newly calved and pursue the same treatment with both at the same time, and you will not fail to note the difference in the way the drop of milk will mix with the water."

The writer of the above says he has never known the test to fail. The theory is that the milk of a pregnant cow is viscous, or has a sticky adhesive quality that causes the particles to cohere more closely; hence the tendency to drop in a mass instead of mixing with the water. The morning's milk should be taken for the test; and rain water, or, better still, filtered or boiled water, should be employed.

4. *Native Mulberry-trees.*—These are probably Cape mulberries. English mulberries could be grafted or budded on young shoots that are thrown out when the trees are headed back. The operation would be a difficult one, as the mulberry is hard to work above ground. Graft in early spring; bud about Christmas.

5. *Growing Medlars.*—Graft medlars on quince stocks in early spring.

6. *Strawberries for the Stanthorpe District.*—Marguerite, Trollope's Victoria, Pink's Prolific, Creswell's Seedling, Aurie, Royal Sovereign, Federator.

7. *Limbs of Apricot-trees Dying.*—Cut out all dead wood, and paint over the cuts where of large size.

8. *Lime, Sulphur, and Salt* can be applied with a brush to patches of grey moss, &c., on large limbs after the trees have blossomed, without damage.

9. *Walnut not forming Kernel.*—The failure to form kernel is probably due to lack of moisture.

10. *Soapy Slops* may be safely thrown round trees and plants, but in moderation. An excess of such slops would be injurious.

11. It is too late for winter pruning when the trees are starting into growth.

12. *Ornamental and Timber Trees for Stanthorpe District.*—Pines of sorts, silky oaks, ligustrums, acacias of sorts, pseudo acacia (Rutinea), plane-trees, American elm, black poplar, cupressus of sorts.

13. *Snake-bite Cure.*—See issues of this *Journal* for 1901, January, 1904, February, 1905.

14. *Advertisements* relating to agricultural products or machinery have always been accepted by us.

PASPALUM FOR SHEEP AND ANGORA GOATS.

W. N. ATKINSON, North Arm, North Coast Line.—

In reply to your question as to whether anyone has tried sheep on paspalum grass on coast country, and with what results, Mr. J. C. Brünnich, Agricultural Chemist, writes:—

"As far as I know, *Paspalum dilatatum* has not been tried on a large scale for pasturing sheep, but I do not see any reason why sheep should not do well on it, particularly on coast country, where paspalum thrives excellently.

"One of the advantages of paspalum over other grasses is that it yields much heavier crops, and also resists drought fairly well. The food value of paspalum itself is not so good as that of couch grass, prairie grass, and cocksfoot, but the lack in quality is made up in quantity.

"Every farmer should have a few acres under paspalum, but I would never advise to do away with all other fodder crops in favour of the one, as a change of diet is most beneficial to all animals.

"I do not think that Angora goats would do well on a pasture of paspalum, as these goats always prefer shrubs and undergrowth, and always do best in rugged, hilly country, but still, as a standby, a small patch of good paspalum or any other pasture should be available to them, particularly during their breeding season."

[We would remind our correspondent that some years ago the late Mr. W. Landsborough placed a large flock of sheep and some Angora goats on his land at Caloundra. These had no other pasture but the coast grasses, and they all died out. If paspalum had then been known as a fodder grass, the sheep at least might have been saved, but it is doubtful, as sheep do not thrive near the coast.—Ed. *Q.A.J.*]

MANURING WITH COWPEAS.

R. AND H. WITTY, Yatala.—

1. The lasting effect of a crop of cowpeas ploughed under will depend on the amount of nitrogen contained in the green manure, and the amount abstracted from the soil by the crop grown. If maize be sown after cowpeas, two crops might be taken off before refertilising. With sugar-cane, of course, the case is different, as the cane would not be ploughed out until probably the third or fourth ratooning; therefore, other means of manuring would have to be adopted after the green manure is exhausted.

2. Cowpea can be ploughed under in from four to four and a-half months after sowing.

3. 9 lb. of seed per acre. Price, about £1 per bushel. Sow from beginning of spring to New Year.

COST OF ESTABLISHING A DAIRY FARM OF FIFTY COWS IN QUEENSLAND.

Intending Settler, Gympie.—

It is impossible to give you anything more than an approximate idea of outlay and return. The following would be a fair estimate. As you already have the land partly cleared and fenced, the cost of these improvements is not included:—

	£
Average cost of cows of fair breed, at £9 per head ...	450
Outlay for bull	30
Labour—1 man at £1 and found	52
2 boys at 10s. and found	52
Milking-shed, milk and cream house	40
Separator and other utensils	25
Cart, cans, horses, and harness	50
Implements	25
	£724

Returns.

Average amount of milk from 50 cows in profit—400 gallons, per annum, per cow	20,000 gallons
Average amount of cream from milk, 40 per cent. fat	16,000 lb.
Total quantity separator milk	18,500 gallons

	£	s.	d.
16,000 lb. cream at 4½d. per lb.	299	19	9
Separator milk at 15s. per cow, per annum ...	37	10	0
	£337	9	9

Pigs.

A dairy farm carrying 50 cows will enable 40 pigs to be kept.

	£	s.	d.
Start with 5 sows at £4 each	20	0	0
Berkshire boar	5	0	0
Piggeries	10	0	0
	£35	0	0

Returns.

Value of progeny approximated for one year £80

Summary.

	£	s.	d.
Total outlay	759	0	0
First year's returns	417	9	9
Dr. balance	£341	10	3

The second and succeeding years, if the seasons and crops are good and the cows well managed, a profit would result, in addition to the value of, say, 40 calves at 10s. each.

As before said, however, although the above is what might be reasonably expected to result, there are so many adverse as well as favourable factors in rural life that it can only be looked upon as an approximate return for a certain outlay.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	NOVEMBER. Prices.
Apples, Eating, per packer, Victorian (out of season)	...
Apples, Eating, per packer, Tasmanian	9s. 6d. to 10s. 6d.
Apples, Cooking	...
Apples, Ordinary, Tasmanian	4s. to 7s. 6d.
Apples, Local	...
Apples, American, Green	12s. to 14s.
Apricots, quarter-case	...
Apricots, American, per 108's	...
Bananas, Sugar, per bunch	...
Bananas, Cavendish, per bunch	...
Bananas, per dozen	$1\frac{3}{4}$d.
Cape Gooseberries, quart	...
Cherries, quarter-case	...
Comquats, case	...
Custard Apples, quarter-case	...
Grapes, per lb.	...
Granadillas, case	...
Gooseberries, English	...
Lemons, American, per case	...
Lemons, Sydney, per case	4s. to 4s. 6d.
Lemons, Local	...
Lemons, Italian, per case	...
Lemons, Italian, per 180	...
Loquats, half-gincase	...
Mandarins, Local	...
Mandarins, Bowen	...
Mangoes, half-case	...
Mangoes, good, half-case	...
Melons, per dozen	...
Nectarines, quarter-case	...
Oranges, Italian, per 180	...
Oranges, American	...
Oranges, Sydney (packers)	9s. to 10s.
Oranges, Sydney (gin case)	16s. 6d.
Oranges, Local	...
Passion Fruit, quarter-case	4s. to 5s.
Papaw Apples, per case	3s.
Peanuts, per lb.	$2\frac{1}{2}$d.
Pears, Victorian, quarter-case	...
Pears, Tasmanian, quarter-case	...
Persimmons, quarter-case	...
Pineapples (rough leaf), per dozen	3s. 6d. to 4s.
Pineapples (smooth leaf), per dozen	3s. 6d. to 4s.
Plums, Black, quarter-case	...
Plums, Light, quarter-case	...
Plums, American, per 108's	...
Quinces, quarter-case	...
Rosellas, per sugar-bag	...
Strawberries, per quart	3d. to 4d.
Tomatoes, quarter-case	2s. to 3s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR NOVEMBER.

Article.		NOVEMBER. Prices.
Bacon (Pineapple)	lb.	5½d. to 7d.
Barley, Malting	bush.	2s. 10d.
Bran	ton	£5 8s. 9d. to £6 2s. 6d.
Butter, Factory	lb.	10d. to 11d.
Chaff, Mixed	ton	£3 15s. to £4 3s. 4d.
Chaff, Oaten	„	£3 12s. 6d. to £4 8s. 2d.
Chaff, Lucerne	„	£5 14s. to £6 15s.
Chaff, Wheaten	„	£2 6s. 1d. to £2 10s.
Cheese	lb.	5½d. to 7½d.
Flour	ton	£8 12s. 6d. to £9 10s.
Hay, Oaten	„	£5 3s. 2d. to £5 7s. 11d.
Hay, Lucerne	„	£3 11s. 9d. to £6 12s.
Honey	lb.	1¼d. to 1¾d.
Maize	bush.	4s. 1d. to 4s. 5d.
Oats	„	2s. 6d. to 3s.
Pollard	ton	£7 to £8 15s.
Potatoes	„	£8 13s. 2d. to £9 19s.
Potatoes, Sweet	„	£3 8s. 10d. to £4 14s. 6d.
Pumpkins	„	£4 7s. 3d. to £5 19s. 2d.
Wheat, Milling	bush.	4s. to 4s. 3d.
Wheat, Chick	„	3s. 6d. to 4s. 3d.
Onions	ton	£17 to £21 12s.
Hams	lb.	8½d. to 10d.
Eggs	doz.	4½d. to 6½d.
Fowls	pair	1s. 9d. to 3s. 2d.
Geese	„	4s. 6d. to 5s. 11d.
Ducks, English	„	2s. 4d. to 3s.
Ducks, Muscovy	„	2s. 10d. to 3s. 5d.
Turkeys, Hens	„	4s. 8d. to 5s. 10d.
Turkeys, Gobblers	„	10s. 8d. to 14s. 3d.

ENOGGERA SALES.

Animal.	SEPTEMBER. Prices.	OCTOBER. Prices.
Bullocks	£11 17s. 6d. to £12 12s. 6d.	£10 5s. to £11 5s.
Bullocks (extra prime)	...	£12 7s. 6d. to £13 15s.
Cows	£6 15s. to £8 15s.	£6 10s. to £8 12s. 6d.
Cows (extra prime)	...	£8 10s. to £10
Merino Wethers	22s.	23s. 9d.
„ Ewes	18s. 9d.	16s. 3d.
C.B. Wethers	26s. 6d.	24s. 9d.
„ Ewes	17s. 6d.	22s. 9d.
Lambs	15s.	16s.
Pigs	...	...
„ Baconers	...	32s. 6d.
„ Porkers	...	24s.
„ Slips	...	1s. 6d. to 6s. 9d.

Farm and Garden Notes for December.

The grain harvest will now be nearing completion. In the early portion of the year it was fully anticipated that another record crop would crown the labours of the wheat-farmers. Unfortunately, the dry weather conditions continued until, at one time, it was feared that the wheat crop throughout the State would prove a failure. Much of the young crop was fed to stock where other sources of fodder failed. When it was almost too late, heavy rains occurred in all the wheat areas during October, and they came just in time to save the late-sown crop. The anticipations of a 3,000,000-bushel crop resolved themselves into hopes of at most 1,000,000 bushels. Unlike the great crop of 1904, when the haulm ran up to as high as 7 feet, the straw this year was very short, although the result of the welcome rain was to fill out and lengthen the ear. The urgency of water conservation, wherever it can be carried out, is once more forced upon the farmers who suffered so severely in the drought in 1902.

Given favourable weather, maize, panicum, imphee, Kafir corn, and sorghum may be sown, and arrowroot, ginger, and sweet potatoes planted.

Kitchen Garden.—Gather cucumbers, melons, vegetable marrows, and French beans as soon as they are fit for use. Even if they are not required, still they should be gathered, otherwise the plants will leave off bearing. Seeds of all these may still be sown for a succession. Tomatoes should be in full bearing, and the plants should be securely trained on trellises or stakes. Take up onions, and spread them out thinly on the barn floor until the tops wither sufficiently to pull off easily. They should then be graded into sizes, and sent to market or stored in a cool dry place. Where there is an unlimited supply of water, and shade can be provided, lettuce and other salad plants may still be sown.

Flower Garden.—Keep the surface of the land well stirred. Do not always stir to the same depth, otherwise you are liable to form a "hard pan," or caked surface, beneath the loose soil. Alternate light with deep hoeings. A few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulacca, zinnia, and cockscomb. Plant out whatever amaranthus may be ready. They may still be sown in boxes. Clear away all annuals which have done flowering. Bulbs should have all the dead leaves cut away, but the green leaves should not be touched. Stake chrysanthemums, and, as the flower buds develop, give them weak liquid manure. Coleus may now be planted and propagated from cuttings. Dahlias are in various stages, but the greater part will have been planted by this time. Give them liquid manure, and never let them dry up. Lift narcissus about the end of the year, but do not store them. Plant out at once in their new positions. Top dress all lawns.

Orchard Notes for December.

By ALBERT H. BENSON.

In the Orchard Notes for November, I called special attention to the importance of marketing fruit properly, emphasising the necessity for careful handling, even grading, and attractive packing if satisfactory prices are to be obtained. Those remarks apply equally to the present month, or, in fact, to any month of the year, as there is always more or less fruit of one variety or another to be marketed; and it is simply wasting time and money cultivating, pruning, manuring, or spraying an orchard—in fact, doing everything possible to produce good fruit—if when the fruit is grown it is not put to the market in such a manner that it will realise the highest price. Careful handling, grading, packing, and marketing will secure a ready sale for good fruit in any market, even when the same fruit badly handled and unattractively got up would be unsaleable. Growers would do well to take a lesson in packing from the Californians who have been shipping apples, or from the Italians who are shipping lemons, to this State, as those fruits, even after a long and trying voyage and one or more transhipments, reach here in better condition and in a much more attractive state than our local fruit, which is often only carted a few miles.

Keep down pests wherever met with; gather and destroy all fly-infested fruit. Destroy orange bugs before they become mature by hand-picking or by driving them to the trunks of the trees, by tapping the other branches with light poles, the insects being brushed off from the trunks and main branches on to a sheet placed under the tree to catch them, from which they can be easily gathered and burnt.

All caterpillars, cut-worms, beetles, grasshoppers, crickets, or other insects destroying the foliage should be destroyed by either spraying the same with Paris green, 1 oz. to 10 gallons of water, or by dusting them with a mixture of Paris green and air-slacked lime, 1 oz. of Paris green to 5 lb. of lime. Keep the orchard well cultivated, especially in the dry districts; and where there is water available for irrigation in such districts all citrus trees should receive a watering during the month unless there is a good fall of rain, when it will be of course unnecessary.

Pineapples, bananas, and other tropical fruit can be planted during the month, showery weather and dull days being chosen. The rainy season is the best time to transplant most tropical plants. Where it is desirable to go in for green-crop manuring or for raising the green crop for mulching, cowpeas can be sown, as they will be found to make a very rapid growth now, which will be strong enough to keep most weeds in check.

See that all surface and cut-off drains are in good working order, and not choked up with grass, weeds, &c., as heavy rain may fall during the month, and there should be a get-away for all surplus water, which would tend to either wash the soil or sour it, stagnant water round the roots of the trees being exceedingly injurious at any time, and especially so during the heat of summer.

Orchard Notes for January.

By ALBERT H. BENSON.

In bearing deciduous orchards, the chief work of the month will be the gathering and marketing of the fruit. This work requires to be carried out in a much better and more systematic manner than is usually the case, as a great deal of our fruit is badly handled, badly graded and packed, and is sent to market in a very unattractive manner. Good fruit always pays for careful handling and neat packing. Use clean new cases, grade the fruit for quality and size, and carefully examine it for fruit fly, scale insects, or codlin moth. All infected fruit should be destroyed by boiling, and be then fed to pigs or poultry, as its presence in the case is apt to condemn the whole when same is examined by the inspectors under the Diseases in Plants Act.

When codlin moth is present, the bandages should be examined every week, and all larvæ found therein destroyed, and all moth-infested fruit should be gathered and destroyed. If this method of treatment is carefully carried out throughout the season, there will be no great difficulty in keeping this pest in check, as it is not generally established, but is practically confined to the Stanthorpe district and two or three other parts of the Downs.

The fruit fly must be systematically fought by gathering and destroying all infected fruit. This is of special importance in the Stanthorpe district, where it will do considerable injury to the later fruits unless every effort is made to stamp it out as soon as it makes its appearance. Fruit imported into this district from other parts of the State should be carefully examined, and, if found infected, should be at once destroyed, as there is no surer way of giving the pest a good start than by the introduction of infected fruit.

Young deciduous trees should receive their summer pruning where necessary. This pruning consists in the shortening back of long straggling growth, and the thinning out of superfluous wood. Its object is to keep the trees strong and symmetrical, and cause the development of fruit spurs along the main branches. The manner in which the pruning is carried out and the result of such treatment in the past can be noted by a visit to the State orchards at Hermitage or Westbrook. Such a visit will well repay any fruit-grower the trouble and expense of the journey to these farms, and will show better than any writing how the work should be carried out.

The budding of deciduous trees can be done now, the only elements necessary to success being that the bark runs freely, that the buds are plump and well developed, and are tied firmly into their places.

In the coastal districts the planting of pines and bananas may be continued if desired, but earlier planting is preferable, especially in the Southern parts of the State. Tropical fruits, such as mangoes, should be planted during the month, choosing dull moist days for the purpose. Mangoes can also be budded or grafted either by the method of plate-budding described by Mr. Knight in the July number of the *Journal*, Vol. VII., p. 41, and Vol. VII., p. 256 (September), or by means of the saddle graft as described in the January number of the *Journal* for 1899.

All citrus fruits can also be budded, taking care to use plump, well-developed buds, and to see that the bark runs freely.

All young trees in the nursery should be kept well cultivated and free from weeds. They should be trained to a single stem, and staked where necessary. Seedling citrus stalks can be set out in the nursery row during seasonable weather.

There is usually a heavy growth of weeds and summer grass in the orchard during the month, so that every opportunity should be taken to keep them in check by means of the harrow or cultivator during dry weather, as, if this is neglected, they are apt to get out of hand during a wet spell. In the drier parts of the State the orchard should be kept well cultivated, and, where water is available for irrigation, citrus trees should receive a good soaking during the month, taking care to give the land a thorough cultivation as soon after the irrigation as it will stand working, as this tends to prevent the formation of a crust and to retain the moisture in the soil. In the Southern coastal districts mangoes and the main crop of pines will be ripening towards the end of the month, so that in the case of the former every precaution should be taken to prevent their destruction by fruit fly by the gathering and boiling of all fly-infected fruit of all kinds. The destruction of scale insects should be continued by either spraying or cyaniding; and where leaf-eating insects are troublesome, the same can easily be kept in check by spraying with arsenical washes, as recommended in the October number of the *Journal* for 1900.

Where it is proposed to plant orchards on new scrub land, this is a good time to fell the scrub, letting it lie till late in the autumn or early winter, when it can be burnt off during dry bright weather. The clearing of forest land can also be continued, the land as stumped being sown with corn preparatory to its being planted with trees the following winter, as the working that the corn receives is a good preparation of the land for fruit.

Farm and Garden Notes for January.

Field.—The main business of the field will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole.

Kitchen Garden.—A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be well watered and carefully protected from insect pests. Sow in narrow, shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly, to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow, well-drained boxes or small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be

sown, as well as a few cucumber and melon seeds for a late crop. The latter, however, are unlikely to succeed, except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying, also garlic, onions, and eschalots, as the tops die down.

FLOWER GARDEN.—To make the flower beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotted leaves. Fill the boxes with the compost, then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle lift them gently, one by one, with a knife or zinc label—*never pull them up by hand*, as by so doing the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil, containing plenty of leaf mould. Then keep a sharp look-out for slugs and caterpillars. Keep a supply of tobacco-dust on hand, scatter this in the path of the slug, and he will cease from troubling you.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet foxhunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed boxes, mulch, shade, water, and kerosene-spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight, and will afford light and profitable occupation for girls with spare time on their hands.

1906.

To its Readers and Contributors

"The Queensland Agricultural Journal"

EXTENDS ITS HEARTY

GOOD WISHES

"The Queensland Agricultural Journal."

We are pleased to be able to announce that the Journal will again be issued, as in past years, every month. For the present, however, the reading matter will be slightly curtailed, yet not to a very appreciable extent. As the prosperity of the State, which now appears to be decidedly on the up grade, becomes assured, the Journal will ere long assume its former proportions, and meanwhile will contain as much instructive and interesting matter as can be embraced in its somewhat limited space. Our readers will, we feel sure, reciprocate the pleasure we feel in being enabled to commence the New Year under the old conditions.

Everything points to a most prosperous year for all classes of producers. The old industries, such as sugar-growing, wool production, wheat-growing, and general farming, together with dairying and fruit-growing, all promise, by the aid of the late bountiful rains, to thrive during the next twelve months, whilst new industries are steadily coming to the front. The advent of many southern farmers who have lately settled in Queensland is an assurance that our lands and their productive capabilities will be well advertised throughout the States of the Commonwealth; and that many more will be attracted to the State, when they are acquainted with our liberal land laws, the cheapness of good farming and dairying lands, the easy terms of payment, and the variety of crops which can be produced throughout the year, cannot be doubted. The extension of our railways to Blackall from Jericho, towards Cloncurry from Richmond, to the Etheridge from the Chillagoe line, will be the means of opening up thousands of acres of agricultural, pastoral, and mineral lands which hitherto have been barely exploited owing to want of cheap and rapid means of transit. By the same means the great tobacco-growing districts of Texas and Inglewood will receive a great impetus. We may be optimistic, but we confidently look forward to one of the most prosperous years in the history of Queensland, and, as a consequence of that prosperity, to a very considerable addition to the population, not only from neighbouring States, but also from Great Britain and other European countries, thus solving the vexed question of white *versus* coloured labour in our rural industries, by the settlement of a numerous white population on the rich coastal and table lands of the State.

Queensland's Progress.

In the year 1898, Mr. John Mahon, Principal of the Queensland Agricultural College, read a paper before the Logan Farmers' Industrial Association, at Beenleigh. In that paper he indulged in some prophetic utterances concerning agriculture and dairying in this State, which at the time were considered, to say the least, Utopian. For instance, we have this passage:—

"The great future that awaits Queensland in the dairying and agricultural industries is beyond the expectation of the most sanguine person. There is no denying the fact that no colony in Australasia, and perhaps no country in the world, affords the same facilities for any branch of farm life as Queensland does at the present day. We have sufficient agricultural land to carry millions of people, 75 per cent. of which is practically unutilised to any remunerative extent other than as sheepwalks, and can be purchased at prices which I consider as a gift. This is not only my opinion, but also that of practical

southern farmers who would never have visited this colony had it not been for my inducing them to do so; and, needless to say, some of these farmers have disposed of their southern homes, and are now permanent residents of Queensland.

"This colony has always borne a bad name in the southern parts of Australia, and especially as regards climate. . . . However, now that we have some of these settlers amongst us, who are delighted with their change from exorbitant prices and high rents for lands, and also a climate that surpasses that of the south, being cooler and more congenial in every way, I feel satisfied that many others will follow."

Following this comes a statement by a Victorian farmer to the effect that "the quality of the land that is being sold here for from £2 10s. to £3 per acre is equal to lands that are being sold in Victoria at £30 per acre. . . . These facts lead me to believe that there will be a great rush for agricultural lands in this colony in the near future. . . . It may be considered bold on my part in stating that the day is not far distant when Queensland will be the premier Australian colony in the output of farm and dairy produce, but I am confident that older men than myself will see this come to pass."

In the matter of dairy inspection and of Government supervision over the exports of dairy produce, Mr. Mahon said:—"In my opinion, the improvement in the methods adopted in milking and in the treatment of milk generally can only be brought about by compulsory legislation. . . . In upholding dairy inspection, I have no axe to grind, and speak only in the interests of the farmers and the welfare of the industry generally. . . . I should like very much to see the farmers take up the matter of Government supervision over the exports of dairy produce."

Mr. Mahon then presented a statement showing the requirements of Queensland for certain produce and the value sent out of the State to supply the same in 1896, which figures, when compared with those for 1905, show that, whereas in 1896 the sum sent out of the State for butter, cheese, bacon and hams, onions, potatoes, wheat, barley, oats, and hay amounted to £664,199, in 1905 the total amounted to only about £82,000 for the same commodities, thus clearly showing how enormously production, especially in butter, wheat, and pig products, has increased since Mr. Mahon made his prediction.

The predicted "rush for agricultural lands" has also become a fact, and to-day all the available surveyors in the State cannot keep pace with the impatience of selectors to obtain farms. The suggested compulsory legislation in respect to dairies and dairy products has also taken shape, and all dairies are now under Government inspection.

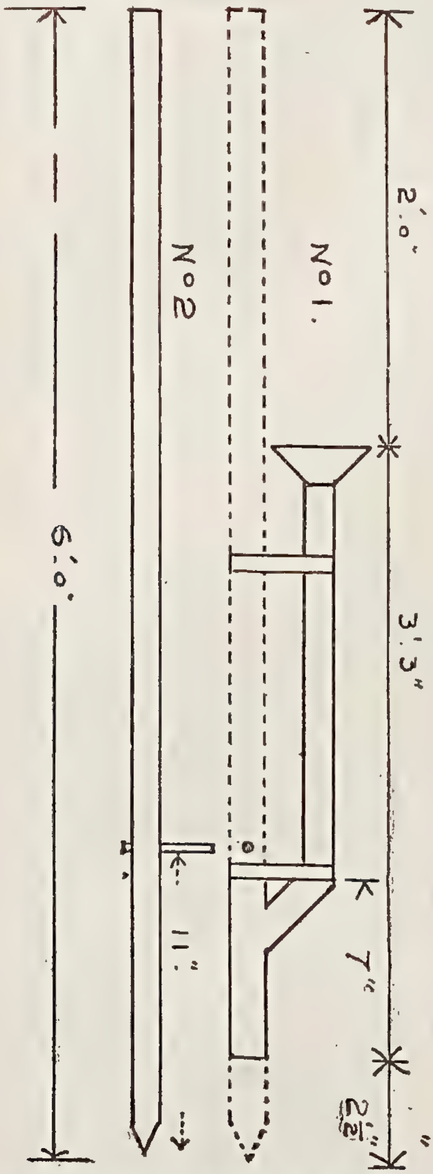
RECORD SALE OF SHORTHORNS.

The demand for Shorthorns in Great Britain shows that this breed is taking precedence over all other dairy stock, however reluctant breeders of other varieties may be to acknowledge the fact. In this view, the extraordinary sale of the Buscot Park herd in England lately deserves special notice. At this sale, 56 head of cattle were sold at an average of £90 8s. 3d. per head, and prices up to 370 guineas were realised for some of them. One purchaser from South America took more than £3,000 worth, numbering about 30 animals. Breeders can thus form an idea of how vast the demand is for foreign countries, and how almost certain this demand is to continue and increase as time goes on. Each succeeding year proves that, although other countries, including Australia, can breed good cattle of very high class, yet they cannot maintain the English standard without continued recourse to blood from Great Britain.

Agriculture.

A HAND MAIZE PLANTER.

Mr. Arthur Jones, Seaview Hill, Bondoola, sends us the following sketch and description of a useful little instrument for planting maize in unstumped scrub land, by means of which the grain may be planted when the surface is so dry that planting in the ordinary way with the hoe is impracticable or, at least, unadvisable. It operates very much in the same way as the potato planter which has been described in this Journal:—



No. 2 is a ¾-inch bar of iron over 6 feet long, tapered for 2½ inches at one end, which must carry full size to start of taper. Eleven inches from the point, a ½-inch 3½ inches long tread is firmly riveted through the bar, as shown.

No. 1 is a tube made of stout galvanised sheet iron. The bottom piece, 7 inches long, made of No. 20 galvanised iron if obtainable, is turned to just fit the $\frac{3}{4}$-inch bar. The other portion is made in the shape shown, with a funnel top. The joints must be very strongly made, with also a stay strap flush with top of the 7-inch piece, and another guide strap about 5 inches from the bottom of the funnel. The $\frac{3}{4}$-inch bar is slipped up through it, and the strain is thus lessened. The bar is shown in position in No. 1 by the dotted lines.

The planter, with bag at waist, grips the bar at a comfortable height with his right hand—if he is a right-handed man or *vice versâ*, if not—and takes hold of the tube immediately below the funnel with his left. He then lifts the tool as high as he can, taking care to keep the sheath tight up to the tread with his left hand; and he then drives the point into the ground in front of him, using only his right hand in the downward stroke. If not sufficiently deep, he may push it deeper with his foot on the tread. While on the downward stroke he lets go the sheath and, by the time the tool is down, has three grains of seed ready to drop into the funnel; this seed goes down the tube till it can get no further, being stopped by the bar. This is only for a second, for when the bar is lifted 6 inches the seed runs down the tube or sheath into the ground. The bar is not let down again, but the sheath is drawn up the bar till it strikes the under side of the tread, and the both are lifted again for the next stroke. It is not necessary to cover the grain; sufficient earth will fall in to do that—in fact, it is best without covering. I am in my sixtieth year, and I can plant nearly an acre a day and not bend my back. I have planted in the uncultivated scrub soil between the stumps and logs, at a depth of 8 inches, putting the seed down where the moisture was, and every stool grew. This was at a time when my neighbours could not plant for want of moisture. Wherever there is any hand-planting to be done, this instrument will be found useful, only using guide poles, and drills are not needed. I have not patented the device, and am prepared to manufacture them for anyone who wishes to make a trial of them.

THOUSAND-HEADED KALE.

A Tasmanian correspondent of the "Pastoralists' Review" writes:—"With the advance in the production of fat lamb raising for export, any reference to a fodder plant likely to prove useful to sheepbreeders in general, or to those more closely associated with the production of lambs for market, should be useful. Kale is gradually finding its way to the front rank solely on account of its great worth as one of the very best plants for fattening purposes. The preparation of the land is similar to that for rape; and the larger the amount of work put into the land intended for the growth of kale, the greater will be the amount of food produced. Always bear in mind that heavy croppers, whether it be mangold, rape, carrots, or kale, require plenty of manure if you want the best results. Kale, if well cultivated and manured, has proved its worth. I have seen it well on to its second year after planting with sprouts as good as ever, having been cut off and fed to sheep the first time, and then fed off by sheep for quite twelve months afterwards. The system of seeding was with a drill, each row of seed being 3 feet apart, and the plants thinned out with a hoe to 18 inches. Plenty of stable manure was used on the land, and the horse hoe kept going until the plants were about 9 inches high. I saw some of this kale cut to feed sheep quite 4 feet 6 inches long, and they ate every part of it. I have seen a 30-acre paddock put in with the horse drill, on which nitro-superphosphate was used as heavy as the drill would pass it, $2\frac{1}{2}$ lb. of seed costing 2s. 6d. per acre, being mixed with the manure, the seed drills 3 feet apart. The crop of plants is rather thick, but the horse hoe passed across the rows will make a splendid paddock of feed, and give room for cultivating when necessary. Kale alone, unlike rape, will not scour the sheep,

fattens readily, and is a grand milk-producing food for cows, and once established stands the dry summer well—comes again after every rain, in fact. Once tried, no sheepbreeder would be without it. Frost does not affect it, and it is often at its best in winter time. Sow in spring time, and it will be ready when other feed is fading away. Those who read these lines may think the trouble too much, but try a little quarter-acre plot; it will convince you that what you have here read is reliable information."

POTATO-GROWING.

Last season some very fine crops of potatoes were grown in the Lockyer district. As a general rule, however, the crop was a poor one, and prices rose to an abnormal figure, as much as £14 per ton being paid. The grower of one exceptionally fine crop of 40 acres gives it as his opinion that deep and thorough cultivation is the greatest factor in producing a heavy crop of tubers. Where manure is used, great care is required. The manure must be buried out of reach of the set. If artificials are used, they should be spread in the drills some time previous to planting.

Where irrigation is adopted, it is possible to ruin a whole crop by unscientific watering. The potato certainly delights in a cool, moist soil, but it is one thing to apply the right amount of moisture and another to saturate the soil. As a general rule, the vines should be allowed to attain a good degree of growth and be well in blossom before water is applied. Some varieties require more water than others, and, some soils being porous and others retentive, varying quantities of water will be needed. Water applied too soon will often turn the vines yellow, and permanently check their growth. On the other hand, if the ground is very dry at the period when the potatoes are setting, as we term the formation of the young tubers, it often happens that no after application of the water will remedy the matter, and a short crop is the result. When the ground gets very hot and dry, and the vines turn dark-coloured and cease to grow, water becomes a necessity at no matter what season, unless the crop has already or nearly matured. If the subsoil is lacking in warmth, it will be found fatal to apply water, even if the soil is very dry. One good watering will often mature a crop of potatoes, but, if the growth of vines is heavy and shades the ground well, two or even three waterings will increase the yield, and can, in no ordinary case, injure it. Thorough cultivation should follow each application of water, otherwise the water furrow will dry and cake, and this is most detrimental to the crop. As in the irrigation of other crops, the irrigation furrows should not be too long, because the water takes some time to go through, and the upper end, by the time the lower end has sufficient water, will have had far too much. In sandy soil water may be run for three or four hours, while in tenacious soils the irrigation may continue for eight or ten hours.

There is one very important point to note in connection with potato-growing by irrigation. Once watering has been begun, the ground should never be allowed to become dry. If this is neglected, the growth of the potato stops. Then growth is started again by a succeeding watering, with the result that the tubers will be irregular in size, or a second crop will be set, thus giving a large quantity of small or ill-shaped potatoes. This we have amply proved in a small crop of Sir John Llewellyns and Northern Stars we took up in December. The watering had been done fitfully, the ground being sometimes allowed to become quite dry. The result was that there were large numbers of small Sir Johns besides a second crop just set, whilst the Northern Stars resembled nothing so much as miniature dumb-bells, some taking the form of stumpy carrots. If potatoes are irrigated before the setting of the tubers, a greater number will be formed than the plant can properly support, few of them becoming large enough for market. On the other hand, if irrigated after the

tubers have formed, there will be fewer tubers but a large crop of uniform marketable size. Deep cultivation, and thus keeping the ground mellow, is most important. The field should never be flooded, nor should the water be allowed to reach the crown or stem of the plants. The tuber is not the root of the plant, and it is the roots, not the tubers, which have to be watered. When the plants are 5 or 6 inches high, the roots are several times that length, and no more deep cultivation should be given them. It is sufficient to use some form of cultivation which will keep about 2 inches of the surface thoroughly pulverised.

As soon as planting is done, the land having been previously well flooded if the weather is dry, harrow with the row, using bull tongues set to run as deep as possible next the row, the outside ones being set shallow. As the potatoes begin to grow, reverse the shovels, running the outside deep and the inside ones shallow, so as not to disturb the roots. Cultivation should be continued as long as the row can be seen. It should be understood that, with irrigation, the land must be well drained or so porous that the superfluous water can easily escape. Stagnant water is fatal to any crop except rice, and especially fatal to potatoes.

Where irrigation is out of the question owing to want of sufficient water supply or to the undulating nature of the land, deep and constant cultivation and thorough pulverisation of the soil will go far towards making a heavy crop.

IRRIGATION AND WATER CONSERVATION.

It should be generally recognised by all classes of the community that irrigation is the foundation of Queensland's prosperity, and that it should not be, as is unhappily too often the case, only thought of when dry seasons succeed each other, and forgotten even after one single year with a plentiful rainfall. Consider what irrigation does for us. It enables us to cultivate to a profit the fertile but arid soils of the Western country. It makes the desert literally to blossom. It makes paying crops a certainty. It multiplies the productiveness and carrying capacity of the land. It renders the farmer perfectly independent of rainfall. It enables the orchardist and vigneron to produce the choicest fruits to perfection, and even when there is a good rainfall it increases threefold the value of the land in such districts. The speculator and investor need not hesitate to make advances to irrigation farmers. If the dwellers in Australasia alone knew what vast areas of fertile land, what inexhaustible stores of artesian water in the West, what numerous mountain streams in the Far North, what facilities for carriage of produce exist in the arid Western districts, the desert and downs country of the latter portion of Queensland would, in common with other districts of the State, be laid under cultivation from Emerald to Longreach, the South-western from Roma to Cunnamulla, and the Northern from Cairns to Atherton and Herberton by hard-working home-seekers, by farmers who understand their business, by men who know that success as certainly succeeds labour in such irrigation areas as night succeeds day.

There is, perhaps, no branch of agricultural science which has been so unaccountably neglected in Queensland as irrigation. Notwithstanding that every farmer, orchardist, sugar-grower, and pastoralist who has lived a few years in the State is perfectly aware that droughts of more or less intensity are of periodic occurrence at intervals of five, seven, or twelve years, yet, up to very recent times, no practical provision has been made either for the storage of water or for obtaining a regular supply for irrigation purposes by means of artesian wells, of shallow gang or tube wells, nor even by pumping from rivers and lagoons, as is being done on the Burdekin delta, at Bundaberg, at Rockhampton, and several other localities. True, artesian water has been flowing from several hundreds of wells in the Western country for many years, and

dams have been constructed on almost every cattle and sheep station in the State, but these wells and dams were not intended primarily for any other purpose but that of watering stock and, perhaps, of irrigating a small vegetable garden. The wheat-grower, the orchardist, the sugar-grower, the dairy farmer, and the pastoralist, all depended alike on an uncertain rainfall for the production of crops and grass. It needs not the testimony of "the oldest inhabitant" to discover the lamentable result of such dependence.

When we consider that the importance of and the necessity for irrigation were recognised more than 2,000 years before the Christian era, we can but marvel that in the twentieth century men are content to depend on the uncertain rainfall to sow, cultivate, and harvest their crops. In this country there are thousands of acres of rich, fertile soil lying idle and worthless, so far as the needs of civilisation are concerned, which have yet to be won to remunerative agriculture by judicious irrigation and drainage. The rainfall in many districts is so capricious, the amount of water needed to produce heavy crops so great, the difficulties in the way of making our soils retain enough of the cloud water which falls to meet the demands are so many, that it must be plain to every practical man and student of agriculture who has devoted much thought to the subject that the time must come when the waters now running to the sea with their tons of unused fertilising matter will be turned to use in irrigating large tracts of the country over and under which they flow. If 12,000,000 acres of the barren sand of the Sahara Desert in Africa, and as many million acres in India, have been rendered fertile by European enterprise, notwithstanding the paucity of freshwater rivers and lakes, what could not be achieved in our richly-endowed State—richly endowed with vast tracts of fertile lands, with numerous rivers flowing full and running, during wet seasons, to the Gulf of Carpentaria in the North, to the Murray River in the South, and to the Pacific Ocean along our extended coast line?

The one thing needful, after population, to make Queensland the greatest agricultural producer of the Commonwealth is that priceless boon—water. Here the capitalist and the engineer have an ample field before them in the way of conserving the vast bodies of water which periodically flood the country, and are, as before said, borne away to the sea, leaving the rivers to gradually dry up and resume their normal state of chains of waterholes. For the cultivators of the soil to be enabled to carry on field operations—to feel certain that, once they have committed the seed to the furrow, the crops, whatever they may be, are assured to them—to be able to cultivate the land whenever they please—to be perfectly independent of rainfall—would, not long ago, have appeared to them a chimerical idea only to be realised in the fabled Utopia. Yet, to-day, the subject of irrigation is so borne in upon the minds of our most intelligent farmers, cane and fruit growers throughout the State that all over the land we find schemes for "wedding the sunshine to the rain," as it has been happily expressed, are being thought out, and where these have eventually been carried out the results have been so remarkable that it would be difficult to mention any extensive area of this favoured Queensland where agricultural production cannot be carried out or increased to an extent which has hitherto been neither "heard of in story nor dreamt of in dream."

Amongst the localities where artesian water is or is not wanting, but where the greatest facilities for water conservation are present, may be mentioned the Warrego district. Here the Warrego River takes its rise in the ranges beyond Augathella, south of Tambo. The distance from the source to a point 8 or 10 miles below Cunnamulla is 350 miles, and throughout the whole of this distance there is everywhere as magnificent wheat land as the most fastidious farmer could wish to put the plough into. In flood time the Warrego becomes a river of magnificent proportions throughout. Yet the whole of this water runs to waste, and the land is valueless to the farmer. An outlay of £100,000 would retain this vast volume of water. A single 10-foot overshot dam erected 4 miles below Cunnamulla would throw the water back

for 30 miles, giving a stream 3 chains wide and 10 feet deep. With several such dams along the course of the river, and with head works at the sources, 10,000,000,000 gallons of water would be retained; and, as no year goes by without one or more freshes occurring in the river, this splendid supply could always be maintained, and yet permit of the irrigation of thousands of acres of cereal and other crops. We will take another case. Near Bundaberg there are 6,000 acres of irrigable sugar lands in what is known as the Woongarra Scrub (although the scrub has long since vanished and has given place to cane-fields). There is only one hill in this locality, the "Hummock," 220 feet in height. There is a river here named the Elliot, a fine stream of clear water, running deep and strong, with stretches 200 feet wide varying in depth from 17 to 38 feet. Other reaches there are from 1 to 2 chains in width connected by "narrows," through which the water runs with great velocity with a depth of from 6 to 8 feet. It has been estimated that 7,000,000 gallons of water pass down the stream every twenty-four hours. The highest point of the cultivated lands of the Woongarra is 117 feet above the surface of the water. It has been proposed to carry the Elliot water by pipes to the top of the Hummock, and thence to distribute it by gravitation over the sugar-fields below. Such a scheme would cost about £70,000, which would be recouped by a water rate of £3 per acre. The whole scheme has been thoroughly worked out, but nothing has as yet been done in the matter.

Numerous other instances could be given of localities where large quantities of water could be conserved, such as Emerald on the Central Railway line, Mackay, the Isis Scrub at Childers, and, to come nearer Brisbane, Oxley Creek, Brookfield, the North and South Pine Rivers, and many localities on the Logan, Albert, Coomera, Pimpama, and Nerang Rivers.

The Balonne, Maranoa, and Moonie Rivers could be locked in a comparatively easy manner at no very extravagant outlay. About 11 miles from St. George is a spot where the Balonne water, by means of a dam, could be run through Cajerribee Swamp into the beautiful Thuraggi Lagoon, and thence, by a watercourse generally dry, to the Moonie, a distance of some 80 or 90 miles. These are only a few instances out of many which could be adduced where it would be profitable for the State, if funds were available, to expend money on that most important work—the conservation of water.

AGRICULTURAL SOCIETIES AND COMBINATION.

The tenant shows, which were originated in Great Britain by the Duke of Portland, have multiplied to a very great extent in England. These small shows are a great advantage to the small farmers and horticulturists, and, furthermore, they act as feeders to local shows, these again to the county shows, and the county shows go to make up the Royal Agricultural Show. There is no doubt that the small country shows which are so frequently held in different parts of Queensland are responsible for the marked improvement which has of late years been so noticeable in the methods of agriculture and the improvement in the breed of horses, cattle, pigs, and poultry, with the further advantage to the local exhibitors and others who profit by what they see, and learn in these directions that they realise larger prices for their stock and produce than they did when they were afforded no means of comparison between their own methods and others more up to date. Yet we have occasionally observed that, in spite of liberal prizes, fine exhibits, and abundant amusements for old and young, there is in some instances a falling off in the attendance, and that where shows are held within easy distance of the large towns it is the town visitors who contribute to make up the necessary crowd. Unless a man is an agriculturist or pastoralist, more than one show in the same district is apt to lessen the appreciation of their value, and it becomes all the

Plate XI.

A Reach of the Elliot River, Bundaberg.
Billabong on the Elliot River.

Plate XII.

Mr. Nichols' Farm on Petrie's Creek.
Clearing a Ti-tree Swamp.

Plate XIII.

A CABBAGE CROP IN A TI-TREE SWAMP.
VIEW ON PETRIE'S CREEK.

more important that agricultural societies should look to the farming community for support rather than to the town dwellers. But even the most enthusiastic farmer does not care—or, if he cares, cannot afford the time—to attend many shows in the course of the year. It would, therefore, appear that much benefit would be derived if two or three neighbouring societies would join hands and hold one large show, instead of several small ones. A glance at the list of societies and their show dates, as published in this Journal, will serve to emphasise our point. Take, for instance, the Lockyer, the Moreton, the Cleveland, Beenleigh, and Logan districts, and several others in which shows are held within a very few miles and at no distant dates from each other. There is comparatively heavy expense connected with the holding of agricultural shows—expense which sometimes lands a society on the wrong side of the ledger, but which would be proportionally lightened by a combination of the societies to produce one good show instead of three. We commend this suggestion to the agricultural societies, some of which have already taken steps to carry it out.

THE VALUE OF TI-TREE LAND.

A ti-tree swamp does not present a very attractive appearance to the farmer, neither does it give promise of bringing forth abundantly anything but rushes and tussocky grass when cleared and drained. But there are certain low lands on the coast, consisting of very fertile soil, which produce no other timber but ti-tree and no other undergrowth but ferns. Such lands are, although not actually swamps, yet very wet, and during continued wet weather become practically swamps for the time being. In the Maroochy district these ti-tree lands have, owing to the energy of some of the farmers, been cleared of timber, drained, and laid under crops of potatoes, cabbages, maize, sugar-cane, and lucerne. The soil, sweetened by deep ploughing and by drainage, has responded bountifully to these labours, and has amply recouped all the labour expended upon it. Notably is this the case on Petrie's Creek, in the Nambour district, where Mr. Charles Nichols and his brothers have been for several years amongst the most successful farmers of the district. On Mr. Nichols' farm is one of these so-called ti-tree swamps. In 1902 the growth of the ti-tree here was very dense. The soil beneath was covered with ferns, and in very wet weather retained much water. The land was quite level, and not raised in knots and clumps of stiff sour mud, like the swamps of the Lower Brisbane. The soil here is, on the contrary, a rich, strong, sandy loam, about 4 feet deep, without a suspicion of sourness in it. As soon as a portion of the land was cleared in 1902, it was ploughed, harrowed, and cross-ploughed, and planted at once with potatoes. These yielded a splendid crop. The experiment was an expensive as well as a hazardous one, but the result is all that could be wished. The cost of clearing the land was £13 per acre. For cabbages, sown broadcast, the soil is eminently suitable, and every year thousands of cabbages are produced on it. The soil appears to be derived from the wash from the higher levels and the ashes of bush fires during countless dry seasons. A perfect drainage has been obtained by an extensive main drain 5 feet wide, 5 feet deep, and 37 chains long, cut from the foot of the rising ground through the ti-tree land to the river. Throughout the whole length of the drain there are regular strata of sea-sand at the lowest depths; then rich soil; next, a layer of ashes; then rich soil again with a second layer of ashes. Large logs, taken from the bottom of the drain, show that the soil has been gradually making until, after the lapse of a long series of years, probably hundreds, the depth has reached 4 feet. Our illustrations will give an excellent idea of the character of the timber, the method of extracting stumps by simple stump-pulling machinery, and the nature of the crops, especially of cabbages, produced. The latter crop is always sown broadcast, and afterwards thinned out, the loss of seed being amply recouped by the reduction in the cost of labour in transplanting.

Dairying.

BREWERS' GRAINS FOR DAIRY STOCK.

On the dairy farms of the Midland counties of England great importance is attached to the value of brewers' grains for milk production. In fact, a grain-hole is considered to be almost as great a necessity on a farm as a rickyard, and it is a common sight to see at wayside railway sidings lines of trucks loaded with brewers' grains from the Burton breweries. There has never been a time since the breweries were established when farmers did not make use of grains. In the days when farmers made cheese and butter the traffic in this food for stock could not compare with what it is in these days of milk trade, for now grains are indispensable owing to the aid they render in the all-absorbing matter of producing milk. Filling the grain-hole is to-day reckoned as important as filling the hayshed. Since milk production instead of the making of butter and cheese have been the farmers' great object, the demand for hay has greatly decreased, and that for milk-producing food like grains and cabbage has risen. With respect to green food, there was a time when British farmers laid down arable fields to grass, because it did not pay to plough them. Now they are glad to make their fields arable for the sake of growing cabbage for the milking cows.

In this connection, Mr. G. Sutherland Thomson, Instructor in Dairying for this State, says that brewers' grains are decidedly objectionable, injurious, and even dangerous as a milk-producing food. They force the flow of milk unnaturally, and, as a matter of fact, in England grains are only fed to the strongest crossbred cows. Purebred stock would be ruined by a course of such feeding. Another objection is that the milk coagulates within half an hour after milking unless it is immediately cooled. Milk from grains-fed cows also has a peculiar flavour, and is absolutely injurious to infants, causing diarrhœa and purging, with often fatal results.

OLD COWS DO WELL.

Most people object to aged cows. They are thought to be worthless as milkers, and it is loudly asserted by some that the older the cow gets the weaker the milk, and depreciation goes on all round. But is all this actually true? Speaking at random it may seem so, but search for actual proof, and perhaps some rather peculiar disclosures may be revealed. The most notorious instance on record of a cow living far beyond her teens and proving as efficient as the youngest is to be found in that grand old specimen, Doctor, now so familiar to all visitors to the Dairy Show. She is a crossbred, but has prominent Jersey characteristics, and is twenty-four years old. She calved on 24th May last, on the two milking-trial days gave about 50 lb. of milk on each date, and finished off by securing the first prize in the milk-butter test in a big class of crossbreds. No doubt many will say she is an exception, and that is true, but her record is interesting all the same; and aged cows are not in such disrepute at the Dairy Show as many might think. The first-prize cow in the herd-book class of Shorthorns was over seven years, the second exceeded ten years, and the third seven years—ages at which cows are hardly regarded as young; and one that was commended had seen more than eleven years. Their produce, too, was highly satisfactory, as the first gave 60 lb., the second 58 lb., and the third 56 lb. in a day. In the other Shorthorn class not eligible for the herd-book some of the ages were eight, nine, and ten years; while Jerseys in

plenty ran to seven, eight, and nine years, and two of the Guernseys were over ten years. Red Polls, too, had exceeded nine years, and in the crossbred classes seven, eight, nine, and ten year old specimens were well to the fore. It may be assumed that the exhibitors are possessed of ample knowledge and experience. If the old cows did not answer their purposes, they would soon make room for younger competitors; and that the old ones retain all their usefulness so fully and long ought to make us all inquire if we are right in the main in dismissing cows when they get up to six or seven years old under the impression they have passed their best and are on the down grade. Taking the cows at the Dairy Show from beginning to end, they do not confirm this step, neither in the quantity nor quality of their milk. The other day, when attending the sale of rather a noted herd of cows, a man remarked to me, "Some of the cows are older here than I thought they would be," and my reply was, "They must be good, or they would not have been kept so long," an explanation, I think, which does not appear to occur to all. So long as a cow milks efficiently it is well to stick to her, and that appears to be the motto of the principal contributors of cows to the Dairy Show.—"Agricultural Gazette," London.

HOW TO TREAT A GASSY CURD.

Gassy curds are very common in the spring of the year, and cheese-makers often find that the production of lactic acid is almost checked when the curd is in the cooking stage. If the cheese-maker has an idea or suspicion that his curd is going to develop into a gassy one, it will be found advisable not to raise the temperature when cooking the curd quite so high as he usually has to do under favourable circumstances, as the curd generally remains longer in the whey when gas is prevalent, and, consequently, becomes very firm—lactic acid does not advance so readily when the curd is firm and hard as when it is in a softer condition. It is, therefore, necessary to favour the production of lactic acid in every way, so that it will in time overcome the gas-producing organisms and expel them from the curd altogether. To do this more acid should be given before wheying-off; the curd should not be dried too much on the racks, and the temperature should be kept fairly high (94 degrees) during the matting process. It will be found on examining the curd that small pin-holes will have formed all through the curd. The matting process should be prolonged until these pin-holes commence to flatten out; then the curd should be milled. The hand-stirring or airing the curd after milling should be continued longer to allow the acid to develop and the gas to escape. The curd should not be rubbed with the hands or treated roughly during airing, or a heavy loss of fat will be the result when the curd is pressed; it should be spread over the bottom of the vat, about 4 inches deep, and turned over at intervals of three to four minutes. It will be found by keeping up the temperature (say 88 degrees) whilst airing that the pin-holes will disappear altogether, thus leaving the curd in a fairly good condition and ready to salt. In this way a floating curd may be treated successfully, and, by allowing sufficient time between milling and salting to elapse, the curd will obtain a nice silky feeling, and a fairly good cheese will be the result.—"Agricultural Gazette."

HOME-CURED BACON.

Some time ago we referred to a bacon-curing demonstration, held at Bathurst, under the auspices of the local Agricultural, Horticultural, and Pastoral Association, the demonstrator being Mr. D. Hogarth, of that city. The process adopted is one that has been in vogue among certain families in the North of England for centuries, and may be considered one of those old family secrets, known only to a limited number, and highly profitable to the owners.

At the demonstration, eleven pigs of varying weight, breed, and feeding were treated. Some of them weighed under 200 lb., while a couple turned the scale at 340 lb. and 350 lb. respectively. All of the bacon has since been cut into, and in every case great satisfaction has been expressed as to the quality of the product. One of the owners has sold all that he could spare of the bacon at 1s. per lb., and would make a great favour of selling the hams at 1s. 6d. per lb. The other owners have so far refused to sell at any price.

Since the article appeared, Mr. Hogarth has been the recipient of numerous inquiries, by letter and otherwise, by persons struck with the manifest novelty of the process, and we are, therefore, encouraged to publish a brief recapitulation of the method adopted, for the benefit of such of our readers as may be interested in the matter, and with confidence that those who chose to try Mr. Hogarth's methods will be well satisfied.

For every 100 lb. of flesh the following ingredients are necessary:—8 lb. dry Black Horse Liverpool salt, 3 oz. saltpetre, 1 lb. good brown ration sugar, and 1¼ oz. allspice. For heavy pigs, especially when there is thick skin, as in the case of old, fat sows, a large quantity of salt is advisable. The process is one of dry-salting throughout, no brine-soaking being permissible. That part of the process which is most novel is the most necessary part—the cleaning of the flesh. After the carcass has been cut up it is allowed to cool for twenty-four hours, and the meat is then placed on a sloping surface, a portion of the salt being rubbed into the skin side with the aid of a stone until every inch of the skin is softened and presents a white, pasty appearance. Then the flesh side is salted by hand, the salt being thoroughly well rubbed in. The salted pork is then piled up and left to drain for forty-eight hours, the liquid drained from it being thrown away. The theory is that this liquid contains all the impurities voided from the flesh, and the result of the demonstration goes to prove that it is this cleaning process which is the most important, and the thorough observance of which ensures the keeping qualities of the finished article.

In forty-eight hours the cleaning should be complete, but if the flesh is still discharging it must not be treated for the next process until it has thoroughly given up all the deleterious matter, after which half of the salt remaining is mixed with half of the saltpetre, and vigorously rubbed in, exactly as in the cleaning process. The balance of the salt and saltpetre is then mixed with the sugar and allspice, and applied with less vigour, but not less thoroughly. The liquid resulting at this stage must be as carefully collected and preserved as that from the cleaning is rejected. This second liquid is liberally poured over the rapidly curing flesh every day or two, care being taken that each piece gets its full quota. The liquid bathing is continued for nearly three weeks, when the bacon is hung up to dry, after which it is smoked, excepting in cases where owners prefer unsmoked bacon. In smoking, nothing but good hardwood sawdust should be used, ironbark or box dust being preferable. Corn cobs are considered useless, being deficient in creosote. The smoking is continued for seven days, and the bacon will then commence to ripen, and will keep for an indefinite time, though it should not be stored in a hot or variable temperature, and should always be kept hanging. It will be better in flavour if not cut into too soon.—"Sydney Mail."

THE ANGORA GOAT INDUSTRY.

At a late meeting of the Texas (U.S.A.) Farmers' Congress, a very interesting paper on the above subject was read by Mr. H. T. Fuchs. The following main points are instructive, and should be noted by all who are either already engaged in the industry in this State or who propose to enter upon it:—

The main thing is to keep your Angoras in a brushy rough range, where they find many different kinds of brush and herbs (weeds). The good qualities

of these Angora goats are so well known that it is hardly necessary to mention them here. Only those few good qualities should be mentioned here that are not found in other kinds of stock. These are: That they thrive best on the roughest, poorest hillsides, where among the rocks they hunt and find their wholesome, mixed food of various kinds of trees and bushes and herbs, briars, vines, and weeds of great variety, such range as would be too poor and too rough for other stock; that they stay healthy and thrifty where they are allowed plenty of new range and clean water; that they can be easily trained, with a little salt and kind treatment, to come home regularly before sundown, as they naturally love their home; that their range can be bought very cheaply.

Their mohair will soon pay for a good fence with which to enclose their pasture, a wolf-proof fence, by using barbed hog-wire. Ten such wires are enough, if they are put up in the right way, by having the posts 20 feet apart and three "stays" between the posts, so the wires are stapled every 5 feet; have the lowest four wires only $3\frac{1}{2}$ inches apart, and add $\frac{1}{2}$-inch each following space upwards. This makes your fence $46\frac{1}{2}$ inches high, as you put the lowest wire 1 inch from the ground. All the wires must be perfectly tight, and the staples should be made of steel wire not quite $\frac{1}{8}$-inch in diameter, and should not be polished, but should be dipped into linseed oil that is well mixed with the cheapest dark-red paint. Where you have no mountain cedar, split mesquite, bois d'arc, or oak will make pretty good posts and stays. Drive the staples in the split side of the wood. This kind of a fence is cheaper and much better than a woven-wire fence, and many a hungry wolf or bad dog gets his hide scratched trying to crawl through this kind of a fence by the barbs, that are as sharp as a needle. The screw-worm flies will "blow" any and every little wound, where the maggots will soon work into the flesh, and the increasing number of the green, screw-worm flies will deposit thousands of their eggs (or fly-blows) into the hair, all around the wound, by which it takes only a few weeks to kill the wolf or bad dog. The goats are not apt to get hurt or hung in such a fence as long as their pasture is not over-stocked with goats.

Their range is improved for other stock, as they leave the grass for cattle, sheep, and horses, as they do not eat grass as long as they find all the brush and weeds they want—in fact, it has been proved in many pastures that you can keep more cattle together with a reasonable number of Angora goats than you can without the goats. The main reason of this is that the grass increases where goats are kept, because there the undergrowth is soon all cleared out, so the sun can shine to the ground again, and the manuring of the surface of the ground is of some importance too. According to my observation during the last twenty-two years, I see that all my shipments have arrived in good shape, and are giving splendid satisfaction. Many people have looked at my goats, and appear to be well pleased with them. It looks like all goat men will never be satisfied without Angora goats. They appear to love them as if they were a part of their family.

Lately many goat men were requested to give their idea about the requirements in the make-up of a model Angora goat. I have not seen any reply to this request, neither did I find time to write my ideas about this matter; but here are a few of the main points: A model Angora should carry his head high, his back should be straight, he should stand straight on his legs, his eyes should project and have a fiery glow, his ears should be broad and long (if he is of the large-eared strain) or they should be so small that they are hardly large enough for an earmark; his horns should be much smaller than those of the common goat; his mohair should be as soft as silk, and should hang down wavy, and should glisten like bright silver or white silk; in all his motions he should show a noble bearing, like he knew and wanted it understood by all who saw him that he is the noblest and prettiest animal in this world.

Of course they must be sheared twice a year, so they do not suffer so much from heat in the summer and to avoid their getting hung in the briars and cat-claws with their long, soft mohair. Success to the Angora industry.

The Horse.

HIGH JUMPING.

A correspondent of the "Agricultural News," London, writes, and we think very sensibly so, on the subject of putting horses over abnormally high jumps. Why, as the writer puts it, should horses be trained to jump over 6-feet obstacles when not one man in fifty will tackle 4 feet if it is very strong? There is not a fence in this State much over 4 feet in height, especially since the old three-rail fences have been done away with, and no man in his senses wants to jump a stockyard; so what object is gained by putting horses over 6-feet timber in show-yards, unless it be to create a sensation? More horses are hopelessly strained by this proceeding than by any amount of hard galloping after stock or by taking logs and the usual low fences met with in the country. In addition to this, valuable lives are often lost, and good horses are killed in a useless attempt to "break a record."

The correspondent alluded to writes as follows:—"It has been announced in the newspapers that the world's record for a high jump has been made, and that a rail 7 feet 10 inches in height has been jumped. Is it necessary to add that this remarkable feat was done in America? Mind, I am not disputing the accuracy of the statement, and I do not seen why an exceptional jumper should not have made such a record. I have once seen 7 feet jumped. This was when Bailey and Barnum's circus was held on Knavesmire. It was certainly a wonderful performance, and the circumstances were not especially favourable, so that where they were favourable it is, I think, quite within the range of probability that the other 10 inches could be jumped. But this is trick jumping, and, though clever enough, is by no means good for getting a man over a country. I asked Messrs. Bailey and Barnum's manager what would happen if he were ridden to the tail of hounds from Knavesmire Wood and over the rails which fence off the racecourse. His answer was brief and to the point; 'I guess he'd fall,' said he. Horses that jump these great heights do not seem to jump at all in our sense of the word. They apparently lift themselves over the rail. What good puropse is served by the trick, it is difficult to see. To begin with, the style in which the horse jumps makes it especially dangerous for his rider, who has only the remotest chance of getting clear of him; and, as before intimated, a horse that jumps in this style cannot spread himself sufficiently to jump water. The biggest jump I have ever seen is the stone wall in the Duke of Beaufort's country, which was jumped for a wager many years ago. This wall is 6 feet high, and is a sufficiently formidable obstacle. Some forty-five years ago there was a bet made about a horse jumping a big wall in Ireland—I think the wall was 2 or 3 inches over the 6 feet, but cannot be sure. One stipulation was that the huntsman was to have hounds at the far side of the wall, and to blow his horn and gallop away to encourage the horse, who was to have three trials. He jumped the wall right enough, but not till the third attempt, if memory serves me rightly. It certainly seems needless to train horses to jump 6 feet or more of timber when not one man in fifty will tackle 4 feet if it is very strong, no matter how big a hurry he may be in."

DRAUGHT STALLION FOR THE AGRICULTURAL COLLEGE.

In October of last year, when Mr. John Mahon, Principal of the Queensland Agricultural College, was at Ballarat (Vic.), he purchased, on behalf of the Department of Agriculture and Stock, a very fine draught stallion for the College stud. The colt cost 180 guineas, and is an exceedingly fine animal,

age 1 year 11 months and 5 days, from imported stock on the side of both sire and dam. "Prince of Pinegrove," as the horse is named, was awarded a second prize at the late Melbourne Show, meeting a class of twenty-six of the best two-year-olds in Victoria. The animal is considered of a perfect type to improve the breed of Queensland horses. Following is his pedigree:—Sire, Federation (11,034), vol. xxiii., imported by S. W. Gibson, Fenwick Stud Farm, Yan Yean. Federation was bred by John Dunlop, of Irvine, Ayrshire, Scotland. Sire, Gallant Barassie; dam, Maggie of Greenbank, by Prince Adine. The dam of Prince of Pinegrove is Fan, by St. Lawrence, which horse was bred by D. Dick, of Ashley, Canterbury, New Zealand. The pedigree shows that Prince of Pinegrove is descended from the best blood in Scotland, and his ancestry can be traced back to the first volume of the Scotch Herd Book.

Botany.

SIMPLE ROADSIDE PLANTS.

As towards the end of the present month the schools will reopen, and the children, as a rule, are fond of flowers, or at any rate fond of flower gathering, and considering that botany lessons are now made a part of the general school work, perhaps a few words on some of our common roadside plants will not be valueless to either teachers or children. The latter, in all probability, will bring to their teachers samples of many flowers which they may have met with during their holiday rambles in the pastures and on the roadsides, and particularly any which seemed strange to them. Among such the teacher will recognise a species of heliotrope, from its general appearance to the garden plant of that name, its forked one-sided spikes of blue flowers, which, it will be noticed, are rolled back. This plant is *Heliotropium anchusaefolium*, a native of South America, which was some years ago introduced into our gardens, and has now become naturalised in most waste places along the sides of fences, &c. In some of the less frequented roads at the present time may also be seen a verbena, from the same country as the last-named plant, which from its more brilliant blossoms has attracted attention; this is known by the name of *Verbena venosa*, or nerved verbena. It is well worthy of a place in the garden; and when seen, as at the present, forming large patches in the by-roads of our suburban townships, the lover of a garden is often tempted to transplant it into the garden from which it has strayed. This plant produces its flowers in heads somewhat similar to those of the well-known lantana. The height of the plant when in the open among grass is only about 6 or 9 inches; the flower is of a rich purple colour. The leaves are of harsh texture, often deeply-toothed, and prominently nerved.

Another of our wild roadside flowers is a rubiaceous plant from the West Indies, *Richardsonia scabra*, which may be seen in company with the last-mentioned. This species has for years past been naturalised in the tropical parts of the State, and is now luxuriating near Brisbane. The plant, though seldom over 6 inches in height, is of widespreading habit, and freely roots from the lower branches. The leaves are of a pleasing light-green, and more or less clothed with light-coloured rather stiff hairs, similar to those found on most other parts of the plant. Flowers small, white, crowded in flattened heads at the ends of the branchlets and at the forks of the stems. After the dropping of the corollas, these heads appear to bear green flowers, the six spreading lobes of the calyx having the appearance of corolla lobes. The roots are said to possess emetic properties somewhat like ipecacuanha, and on this account the plant has in some parts been called white ipecacuanha.

The Orchard.

A SHIPMENT OF APPLES AND PEARS FROM AMERICA.

Notwithstanding the persistence with which we are told that only Americans know how to pack fruit for export to perfection, it would seem that this perfection is not always attained. The "Fruit World," in a notice of a consignment of apples and pears by the Vancouver mail steamer "Miowera" to Messrs. Farrah Thomas and Co., from Seattle, says:—"All were packed in ordinary dump cases containing about a bushel. The dessert apples 'King' were very fine, but the variety is too large for successful export, unless packed in compartment cases. Fully 50 per cent. arrived in unmerchantable condition, and all were more or less bruised. We fear it will take even the Americans, who are so quick to grasp new ideas, a very long time to be convinced that the value of fruit is determined by its packing. The best apples of this consignment sold at 15s. per case, and this amount would have ruled for the lot had they been of equal merit. The pears, which were a sort of Beurre Capiamont, were in the same bad state, but those that arrived in good condition were very delicious, and brought 18s. per case. It is utterly wrong to pack a delicate fruit like the pear in a bushel case for export, because, ripening as it does, even in cold storage, every bump the case receives damages each individual fruit. In exporting pears the best package is the cheapest in the end, and also in the beginning, for if they reach their destination in good order there is no kind of exotic fruit that is more highly appreciated or which commands a better price. We strongly recommend the Americans, as we have many times advised Australians, to pack their fruit exactly as they would pack eggs, and they will be abundantly satisfied with the result."

PROTECTION OF FRUIT AGAINST BIRDS.

Poisoning fruit for the destruction of birds may be carried out successfully, provided proper precautions are taken. For this purpose, says the "Fruit World," it would be advisable to choose trees that ripened earliest, for by that means you would have a start on the birds before your main crops came in; this applies also to apples, pears, and other fruits.

It would also be suggestive to place some prematurely ripened fruit of any variety available amongst the branches of any class of fruit to be protected some weeks before ripening. This fruit would be poisoned, and draw the birds before the cherry or other fruit season opened.

This might be taken as a hint by fruitgrowers generally as to how to cope with bird pests before the real fruit season begins. Anticipate it. Then, again, different varieties of fruit placed in the branches of a pear or apple tree would be known to be poisoned, and would thus give more personal security to pickers. As to the poison itself, that is a matter needing immediate attention by all concerned; it must be sweet and adhesive, so that rain will not wash it off too readily. It would not be so difficult to apply to cherries, as the hanging fruit could be quickly dipped into a small vessel held beneath the fruit.

Finally, we say—

(1) Select one or two trees per acre, and treat wholesale with poison.

(2) Also, where possible, hang up ripened poison fruits of other varieties one or two weeks before crop ripens.

(3) Label your tree on four sides "poisoned" in letters of not less than 2 inches in depth.

(4) Do not lay poison indiscriminately.

(5) Every grower should systematically follow out some practical method, and not leave it to his neighbour only.

(6) In planting future orchards be sure to plant a few very early fruits, to be used as poison baits for starlings.

SHADING PINEAPPLES.

The Curator of the Botanic Station at Dominica makes the following suggestions with regard to the desirability of shading pineapples during the fruiting period:—

An experiment was made in shading pineapple plants from the time of flowering until the fruit was ready to be cut. The effect was very marked, the shaded plants being healthier and the fruits more perfect in shape than those unshaded.

Probably pine plants would benefit if grown under light shade from the time of planting, as in Florida, but in any case it is necessary to shade during the fruiting period, if the best results are desired. To shade beds of plants is not an expensive matter. Forked sticks, bamboos, and palm leaves are generally easily obtainable, and are very suitable for the work.—"Agricultural News," Barbados.

PREVENTING DECAY OF RIPE FRUIT.

With reference to the article on this subject published in the last issue of the Journal, we have been informed by Mr. W. H. Parker, of Glen Retreat, Enoggera, that twelve months ago Mr. A. H. Benson suggested the method of preventing decay of fruit during transit, by means of a 3 per cent. solution of commercial formalin, to the Citrus Fruitgrowers' Association in Brisbane. The suggestion was acted on, and a case of oranges was treated and shipped to Melbourne, with a request that the agent there would report on the result. The latter, however, ignored the request, and nothing has since been done in the matter, although the preparation of ripe fruit to enable it to reach the end of a voyage in perfect condition should, one would think, be of great importance.

MILKING ON ICE.

This attractive idea appears at last to have been brought into the realms of practice through the invention by Mr. G. Busck, of Copenhagen Milk Supply Company fame, of a milking pail specially designed for the purpose, with which experiments have been carried out for some time past by the said company. As milk is drawn from the cow it is, we know, if the cow is healthy, itself wholesome and free from germs. The pail is constructed with a ball-shaped receptacle 5 or 6 inches in diameter let into the bottom of the pail, which is filled from underneath—*i.e.*, by inverting the pail—with a freezing mixture of ice and salt that in two or three minutes attains a temperature of 5 degrees below zero (Fahr.). The milker milks on to this ball, and the milk is instantly cooled to a safe temperature. It can afterwards be still further chilled, if desired, and kept at as low a temperature as needful to prevent germ growth until it is bottled.—C. W. S., "Agricultural Gazette."

Tropical Industries.

RICE-GROWING.

In the Annual Report of the Under Secretary for Agriculture of 1899, the following remark on rice culture in Queensland is worthy of note:—

Rice, being a crop more especially adapted to the North, did not come under the ban that was placed upon the grain crops that are grown in the South, and was favoured with a good season. This is becoming a staple grain crop in that part of Queensland, the area for 1898 showing an increase of 418 acres over 1897, that for the former year being 863 acres, with a yield of 38,133 bushels, or an average of 44·19 bushels to the acre, as against 29·19 for 1897. Hitherto rice has been in the experimental stage, has been grown in many parts of the colony, and has fluctuated in area as success or non-success has been met with. It is, however, now settling down to be the property of the Northern district, and it is to that part that the future supply may be looked for, and it behoves the farmers to be careful to grow the variety to suit the market, for of all grains rice is most subject to prejudice and favouritism. It is the grain that in the largest quantities comes into the hands of the consumer in the form that is most nearly allied to the original state, and so is dependent upon the fancies of the consumer for the variety that shall command the highest price. From the figures of the Registrar-General, Queensland at present [1899] produces 14 per cent. of its annual consumption, the statistics being: Production (estimated at the rate of 162 lb. of paddy to the 100 lb. of clean rice), 1,318,176 lb. of clean rice; and the imports 8,235,564 lb., of a value of £49,456. The principal district for rice is that of Cairns, which produced 82 per cent. of the total yield, 708 acres being cropped for 33,540 bushels, or an average of 47·30 bushels to the acre."

Only one year later, the cultivation of rice had fallen to 319 acres, producing 9,275 bushels, averaging 29·08 bushels per acre.

How are we to account for this great decrease? Is it owing to the cost of production, to the poor variety grown, to the yield per acre, or to the price obtained? Take, first, the average produce per acre. This varies from 30 bushels to 60 bushels of paddy, and even much higher returns have been obtained in the Pimpama district, near Brisbane, where there is ideal rice land. The bulk of the Queensland-grown paddy has usually been sold at 6s. per bushel—that is to say, that an average 40-bushel crop brought the farmer a gross return of £12 per acre. At this rate, 1½ acres of paddy gave 1½ tons, equal to 1 ton of clean, marketable rice, worth from £19 to £24 per ton, and the pollard is worth £2 per ton. The yield of straw amounts to from 3 to 4 tons per acre, worth from £2 to £3 per ton. The cost of production and harvesting are the same as the cost of wheat-production—viz., about 19s. per acre. The cost of milling, polishing, &c., amounts to about £2 per ton. Thus it will be patent to any agriculturist that there is more money in rice cultivation than in wheat or maize, the cost of production being about equal. It cannot, then, be that this item is the cause of the slump in rice-growing. Now, as to the poor variety grown. No doubt in former times, when few had any knowledge of the industry, all kinds of rice were sown, mostly of unsuitable varieties; but, thanks to the Department of Agriculture, the very best kinds were introduced, the kinds which yielded the heaviest crops of the most marketable kind of grain. This disposes of the argument about quality and quantity. We have already shown that the yield per acre far exceeds that of wheat, and that the price paid for paddy was much above what is paid for wheat, and over double what was paid for maize.

How is, then, the abandonment of rice culture to be accounted for?

In the first place, rice was mainly grown in the North by Chinese. Although the Chinaman is a perfect slave as an agriculturist, yet, if he finds a crop which demands little or no cultivation, but which will return him a rich harvest, and another which will return a rich harvest, but which demands a considerable amount of labour, he naturally chooses the former. The latter was presented to him in the shape of bananas, and the consequence was that he abandoned rice-growing and took to banana-production. This accounts for the failing of the industry in the North. But why did the white men in the South give it up? Simply because they were disheartened by their losses in the great drought. Rice had failed them, and they took to sugar and arrowroot, corn and potatoes.

Why they should have done so is one of those things that no fellow can understand. The land most suitable for rice was theirs. So good was this land considered that its value rose from £2 to £8 per acre.

Many persons still hold the belief that rice can only be grown in swamp land which can be easily flooded, and that the crop must be laboriously planted by hand, and kept continuously flooded until the grain is almost ready for harvesting. This is quite true where swamp rice is concerned. But there is another kind—the upland or mountain rice—which requires little more moisture than wheat or oats. This is the variety which has been planted in Queensland, and from which such excellent yields were obtained. There is no need to describe the method of sowing and harvesting. Those who know anything of wheat culture may adopt the same methods as in the case of wheat. Rice, however, is cut when the straw is still green, with the result that a second crop, almost equal to the first, is obtained. It is well to stack rice for a fortnight after it has been cut. Then it undergoes a sweating which hardens and whitens the grain. There are two or three rice mills in this State capable of dealing with a large crop, so that farmers growing rice would have no difficulty in disposing of their produce. We hope that the rice-growing industry will revive ere long in Queensland, as there is unquestionably more money in it than in many other industries. The facilities in this State for profitably growing such products as sugar, coffee, cotton, sisal hemp, tobacco, and rice are so great that we have little doubt that eventually, when our rural and other population shall have doubled itself, their production will figure largely in our lists of exports. Tobacco, sugar, and butter have already reached the export stage, and wheat has already been exported to some extent.

MANILA HEMP.

Several inquiries have been made of us as to the probabilities in connection with the growing of the *Musa textilis*, or fibre-producing banana plant of the Philippine Islands, where the plant goes by the name of "Abaca." "This plant," says Mr. H. T. Edwards, fibre expert of the Bureau of Agriculture at Manila, "enjoys the unique distinction of being strictly a Philippine product. It has been introduced into India, Borneo, the West Indies, and other parts of the world (also into Queensland.—Ed.), but only in the Philippine Islands has the fibre ever been successfully produced as an article of commerce, and there only between the parallels of 6 and 25 degrees north latitude."

The climate of North Queensland between Townsville and Cooktown is eminently suited to the growth of a banana which is indigenous in all the coastal scrubs. *Musa textilis* thrives well at the Kamerunga State Nursery, and numerous suckers have been planted out elsewhere. The first stalks are ready for cutting at from twenty months to three years after planting. After the first harvest, it is customary to cut over a plantation in the Philippines about every eight months.

The abaca plant, when mature, consists, like the ordinary banana cultivated in Queensland for its fruit, of a cluster of about twenty stalks in all

stages of development. Usually two or three mature at the same time. The stalk is ready for cutting between the time of the appearance of the flower and the development of the fruit. If cut before or after this time, an inferior quality of fibre will be obtained. The stalk is cut about 2 or 3 inches from the ground, in a slanting direction, to enable the stump to throw off water, which otherwise would penetrate to the root and rot out the whole clump.

EXTRACTION OF THE FIBRE.

The extraction of the fibre should begin within twenty-four hours after the cutting of the stalk. If left for a longer time, the fibre becomes weakened and discoloured.

The trunk of the abaca, often from 12 to 15 feet long and from 1 to $1\frac{1}{2}$ feet in diameter, consists of a soft, fleshy, central stem, 1 or 2 inches in diameter, around which are a number of thick overlapping layers, each layer being the stem or petiole of a leaf. The fibre is obtained from the outer portion of these leaf stems. The process of extraction consists of two distinct operations: First, the removal of the ribbon-like strips of fibrous material from the leaf stems; and, second, the separation of the individual fibre by pulling these ribbons under a knife.

The labourer, sitting on the ground with a trunk of abaca across his knees, inserts under the bark of one of the leaf stems a small, sharp piece of bone, called a "locuit," and pulls off a fibrous strip 1 to 3 inches wide and as long as the trunk. One stem will yield two or three such strips. When these fibrous strips have been taken off, the remaining fleshy material is removed, and each consecutive layer is thus worked down to the central stem of the trunk. The fibre obtained from the three or four outer layers, which are green and hard, will be coarse and dark-coloured, while that coming from the layers nearer the centre will be very fine and white. The latter is not often stripped by the natives, as it is too liable to break under the knife, but when extracted by this method is only used for the manufacture of various kinds of cloth. When a quantity of these fibre strips has been collected, they are carried to some central point, where a shed has been erected and an apparatus set up for stripping the fibre. This shed consists of a frame of bamboo poles covered with abaca leaves. The stripping apparatus, called "panguijan," is simple both in its construction and operation. It consists of a log set in a horizontal position, 1 or 2 feet from the ground. On the top of this is fastened a block of smooth hardwood. Over this block is placed a "bolo" or knife having a blade about 1 foot long and a handle 18 inches long. A rattan is attached to the end of the knife, and is connected with a bamboo spring above. The bamboo spring holds the knife down upon the block. Its pressure is easily regulated by lengthening or shortening the rattan. By means of the foot-tread, the operator raises the knife when he desires to insert or remove a strip of fibre.

The operator holds one or more of the ribbons in his right hand, and also a short round piece of wood. The strips are inserted under the knife, and are drawn through with a quiet, steady pull. The ribbon is then removed and reversed, the cleaned end being wound three or four times round the stick. This process removes all the fleshy material, leaving in the hands of the operator a small bunch of clean, wet fibre. The fibre is sorted into two classes.

The work of extraction is very exhausting, even for the experienced operator, and many labourers are ruptured by the excessive strain of pulling the strips under the knife. It is a fair day's work to strip one arroba (25 lb.), and the stripper will usually work only two or three days a week. All the fibre produced on the islands is extracted by this simple apparatus.

When serrated knives are used, the fibres are only partly separated, and only a portion of the pulp is removed. The work is easy, the yield large, and the fibre is inferior in quality. The grade of fibre depends on the kind of stripping knife used. As a result of using serrated knives, the markets have been flooded with enormous quantities of inferior fibre, and cordage manufacturers are continually making complaint about the quality of Manila hemp.

FIBRE-EXTRACTING MACHINERY.

Numerous attempts have been made to extract abaca fibre by machinery, but, although some have apparently been successful, some obstacle has always prevented their coming into general use. The greatest difficulty has been that abaca, being a very long fibre, would not bear the strain of full tension while being cleaned. The machines thus far constructed have all been based on the old hand process of extracting the fibre by stripping.*

Abaca, after being stripped, is hung on bamboo poles to dry, a process which takes from three or four hours to two days. When thoroughly dry, it is collected, tied up in hanks, and shipped to the nearest market. The purchaser, before exporting it, sorts it into different commercial grades, and it is then packed in bales weighing 2 piculs (275 lb.).

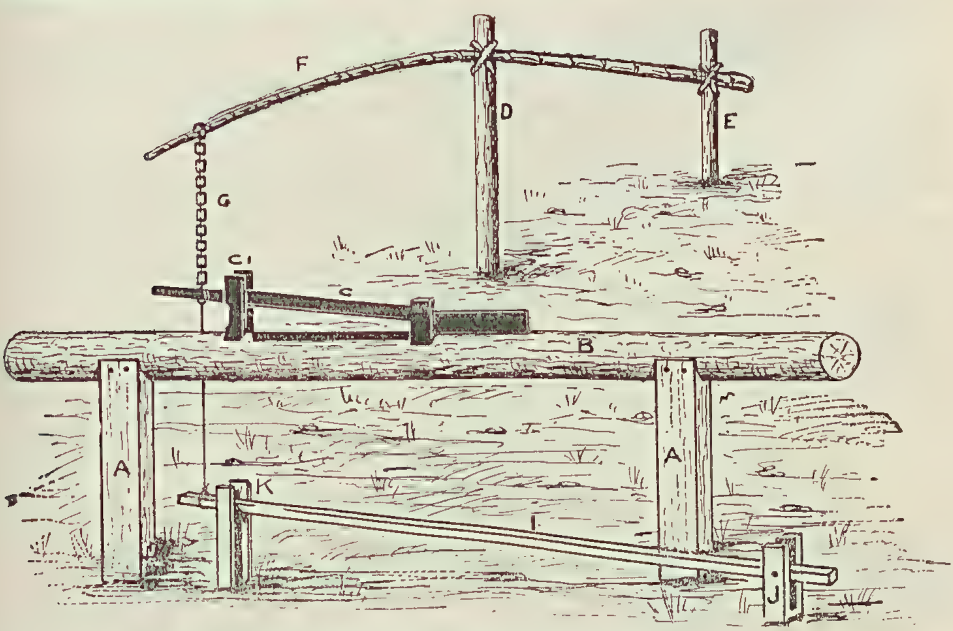
DESCRIPTION AND YIELD.

Abaca fibre of good quality is from 8 to 12 feet long, of a glossy white colour, very light and strong, and of clean, even texture.

The yield of fibre varies greatly in accordance with the variety of plant, the soil, the climatic conditions, and the method of extraction used. Under favourable conditions, the annual yield will average from 687½ lb. to 967½ lb. per acre, but the average yield throughout the islands is probably below this figure or less than half the above quantity. From one-third of 1 lb. to 1 lb. of fibre is obtained from a single stalk. With 568 plants per acre and an annual yield of 4 stalks per plant, the return from 1 acre would be 1,475 lb.

From the above abridged report, which we take from the Manila "Daily Bulletin," it will be seen that the establishment of the Manila hemp industry in Queensland is at present amongst the impossibilities. In the first place, there is no machinery available for the rapid extraction of the fibre; and, in the second place, our labour conditions are absolutely prohibitive of fibre-production by hand. In the Philippines, practically all labour employed can be paid for in rice, cloth, and other commodities—the truck system, in fact, under which all employees may be compelled to take out their meagre wages in goods, and that at prices which will leave a good profit to the employer. However profitable an industry for the Philippine planter, it certainly cannot be carried on under present conditions in any portion of Australia.

The accompanying illustration will give the reader an idea of the primitive machine above described:—



* Sisal fibre scutching-machines are useless for abaca fibre.

(Translation of a Statement by H. Semler, in "Tropische Agricultur," 1888.)

Many attempts have been made to introduce the abaca into other countries, but these attempts have been given up, not, as has been stated, because the plants will thrive nowhere so well as in the Philippines, but because the rates of wages in those islands are so low, and the abacas grow so profusely, not requiring any exertion on man's part to cultivate them, that competition with them is impossible.

Were there a suitable scutching-machine for the purpose of winning the fibre invented, it is possible that many tropical countries might successfully compete with the Philippines.

MANUFACTURE OF LEVULOSE.

"Tropical Life" for August has the following note on a new process for manufacturing levulose or "fruit sugar" from chicory roots:—Mr. Sigmund Stein, the sugar expert of Liverpool, is said to have discovered a way of obtaining a sweetening substance, called levulose, by a purely mechanical process and without the use of chemicals, from chicory roots. This may lead to chicory being cultivated on a large scale in England, where it used to be grown fairly extensively near the city of York. Levulose is said to be six times sweeter than sugar obtained from cane or beet, and up to the present discovery was obtained from dahlia roots and sold at 6s. per lb., whilst by Mr. Stein's process it is thought possible that it would be sold at 6d. per lb., and still leave a good profit. If this is so, levulose will cut out many of its competitors, especially for sweetening champagne and aerated waters. The product is also called "fruit sugar," and seems to be of the nature of honey.

BENEFICIAL INSECTS IN COTTON FIELDS.

In a recent number of the "Agricultural News" (Vol. IV., p. 266) descriptions were given of the cotton aphis and the insects that feed upon it. The cotton aphis sometimes occurs in great numbers on the leaves of the cotton plant, and as each individual lives by sucking the juice of the plant considerable injury may result to the plant. The aphis is, however, generally held in check by beneficial insects. These insects are predaceous in their habits and voracious feeders, each individual eating a large number of aphis each day.

Unfortunately, cotton-planters do not in all cases recognise these insects, and it is in the hope of creating a better understanding as to the useful insects found on the cotton plants that this matter is again referred to. Quite recently a report was received at the office of the Imperial Department of Agriculture from a planter to the effect that his cotton was being seriously attacked by several small insects, the worst of which was a small red bug. A visit to the field in company with the planter revealed the fact that the small red bug complained of was the red ladybird (*Cycloneda sanguinea*), Fig. 20, *b*. Another was the spotted ladybird (*Megilla maculata*), Fig. 20, *a*. Both these were very abundant, the red ladybird occurring in numbers on nearly every plant. The larvæ of these insects were also present, and

FIG. 20. LADY-BIRDS.

lastly the lacewing fly (*Chrysopa sp.*). An energetic warfare had been instituted against all these insects, a large number of them having already been

killed. The only evidence against them was that they were numerous, and that the leaves of the plants showed signs of having been eaten.

So thoroughly had these friendly insects done their work that very few aphis were to be found. The holes in the leaves had been made by the cotton worm, but at that time very few worms were found, and no other leaf-eating insects were to be seen, in consequence, probably, of the fact that these fields had received an application of Paris green a few days before. The fears entertained by the planter that his cotton plants were being destroyed by the insects he reported were entirely groundless. The *rôle* played by each of these beneficial insects was carefully explained, and that particular planter will not again waste time and money in trying to exterminate from his cotton fields his insect friends.

FIG. 21. LACE-WING FLY. (Enlarged.)

Of the ladybirds, the red one is generally much more numerous than the spotted one. It is of a blood-red colour, about $\frac{1}{4}$-inch long and $\frac{1}{5}$-inch wide. The spotted ladybird is of a pinkish-red colour with black spots on its back. It is longer and narrower than the red one, a little more than $\frac{1}{4}$-inch in length and about $\frac{1}{6}$-inch in width. The larvæ of these two species are much alike (see Fig. 22, *c*), the eggs being also much alike. The eggs are small, oval, orange-red in colour, and are to be seen on the leaves of the cotton plant.

FIG. 22. EGGS AND LARVÆ.
a, Eggs, and *b*, larva, of lacewing fly; *c*, larva of ladybird. All enlarged.

The lacewing (see Fig. 21) is a small, green insect with gauzy wings. The body is about $\frac{1}{2}$-inch long, and the wings spread nearly an inch. These insects may be seen flying about in the cotton fields or walking about on leaves or stems. The larva or grub is small, pointed behind, and is armed with a pair of long, strong jaws. The eggs of the lacewing are small, white objects attached to a long stalk. (See Fig. 22, *a* and *b*.)

It is very important that these insects should be recognised by planters as beneficial, and that they should not be killed. They do not eat the leaves nor in any way injure the plant.—"Agricultural News," Barbados.

ARDGOWAN KING FRITZ.

In our notice of this bull in the December issue of the Journal, it was erroneously stated that he was imported from the south; whereas the bull was purchased in 1904 by Mr. Stewart, when he was commissioned by the Department of Agriculture and Stock to proceed to Scotland and England to bring out high-class dairy cattle and pigs for the improvement of the St. Helena and Agricultural College herds.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

SEVENTH LESSON.

METALS.—GENERAL PROPERTIES AND CLASSIFICATION. LIGHT AND HEAVY METALS. ALKALI METALS: POTASSIUM AND SODIUM.

Metals are elements which are capable of uniting with oxygen in forming compounds, called **Bases,** which have an alkaline taste and reaction. A strict line separating metallic elements and non-metallic elements cannot be drawn, as many metals form also oxides which have an acid character *(anhydrides).* Some metals also form a third class of oxides, which, having neither basic nor acid character, are called *indifferent oxides.*

As a rule, metals do not combine with hydrogen, but have a great affinity for the elements of the halogen group—chlorine, &c. The physical properties, metallic lustre, good conductivity of heat and electricity, are also characteristics of the metallic elements. With the exception of mercury, all metals are solids at ordinary temperature. Some metals are very malleable and ductile; they can be drawn out into fine wire or rolled out into very thin foil. Gold is a good instance, as it may be rolled out and beaten out into gold leaves so fine that 282,000 of these leaves would only form a pile 1 inch high.

Metals in solid masses have general metallic gloss and a whitish-grey colour. Only a few metals—for instance, gold and copper—have a pronounced colour.

Metals form with each other certain homogenous masses, composed of two or more metals, called **alloys.** Alloys cannot be regarded as simple mixtures, as in most cases the properties of the individual metals are disguised, but, on the other hand, they cannot be taken as chemical compounds, as the metals may be present in ever-varying proportions. We must consider an alloy as a solidified solution of one or more metals in another. The alloys of mercury, or the solution of other metals in mercury, are called **amalgams.** A very peculiar property of the alloys is that the melting point is generally much lower than the melting point of the metals forming the alloy. The physical properties, hardness, ductility, and conductivity are also considerably changed.

Chemical compounds of metals found as minerals and used for the production of the metals are called **ores.**

The specific gravity of the metals varies from ·59, the specific gravity of the alkali metal Lithium, to 21·8, the specific gravity of Iridium; and, in accordance with the specific gravity, we may divide the metals into **light metals,** having a specific gravity under 5, and **heavy metals,** with a specific gravity over 5.

Light metals, as a rule, possess a greater affinity for oxygen; they oxidise much more readily, as exposed to the air the metallic surface tarnishes and becomes covered with a layer of a basic oxide. The oxides of the light metals are very strong bases. The chemical compounds are, as a rule, easily soluble. This group of metals may be subdivided into:—

(*a*) **Alkali metals**: Potassium, sodium, and a few others.

(*b*) **Metals of the alkaline earths**: Calcium, magnesium, &c.

(*c*) **Earthy metals**: Aluminium, &c.

Heavy metals do not oxidise so easily, the oxides and sulphides are generally insoluble, and their compounds *(ores)* found in Nature have generally

a metallic appearance. A few of the heavy metals, **noble metals**, like gold and platinum, cannot combine directly with oxygen.

Alkali metals form a group of five elements which have a great resemblance in their chemical properties; they easily oxidise in the air, and decompose water at ordinary temperature. Like all other families of chemical elements, the members of this group show a characteristic gradation in their properties.

Potassium (K, from Kalium). This element exists in all plants, and is generally more abundant in the leaves and small twigs. Most plants contain potassium sulphate and chloride, but the greater part of the potassium is found combined with vegetable acids, like tartaric acid, oxalic acid, and others. When a plant is burned, these organic acids are destroyed and the potassium left in the plant ash as potassium carbonate. Potassium is found in Nature in various minerals; *granite*, for instance, contains about 5 per cent. of potassium. All potash salts, which are absolutely indispensable to plant life, present in the soil are originally derived from the decomposition of granitic rocks.

Potassium is a silvery-white metal, which tarnishes instantly when exposed to the air, and is for this reason preserved by being kept in naphtha. It is lighter than water, and it decomposes water with such violence that the liberated hydrogen is ignited and also inflames the metal, which burns with a peculiar lilac flame. (Repeat *Experiment 33* of 4th Lesson.)

Potassium hydroxide *(caustic potash)*, KOH, is obtained in the above experiment by the action of potassium on water:

$$K_2 + {}_2H_2O = 2KOH + H_2$$

On a large scale it is manufactured by boiling a solution of potassium carbonate with lime:

$$K_2CO_3 + Ca(OH)_2 = 2KOH + CaCO_3.$$

Lime carbonate is precipitated, whereas the potash remains in solution, the clear liquid is poured off, evaporated first in iron vessels and finally in silver vessels, until on cooling the liquid solidifies.

Caustic potash is one of the most powerful alkaline substances used by chemists, it is easily soluble in water and alcohol. It absorbs water and carbonic acid eagerly from the air. A solution possesses powerful corrosive properties, it acts on skin and any organic tissue, destroys wool and paper, and cannot, therefore, be filtered through paper. When boiling fat or tallow with a solution of caustic soda, the fat is dissolved, and a solution of **soap** is formed. This soap is always soft, and is called *soft soap*. (*Experiment 53.*)

Potassium carbonate (K_2CO_3) is always found in the ashes of plants, from which it may be extracted with water. By boiling such a solution down, the *crude potash* or *pearl ash* of commerce is obtained. A ton of wood yields from 5 to 12 lb. of pearl ash. This salt is used in many industries and manufactures, chiefly in soapworks, manufacture of glass, and in dyeing works.

The fleeces of sheep contain a considerable amount of potash salts, which may be recovered from the water in which the wool was washed. It is also obtained when **cream of tartar** or *hydrogen potassium tartrate*, $KHC_4H_4O_6$, is heated. Cream of tartar is a salt of *tartaric acid*, $C_4H_6O_6$ or $C_2H_2(OH)_2(CO_2H)_2$, which is deposited as a hard crystalline crust, called *argol* or *tartar*, in wine casks during the fermentation of grape juice.

Potassium sulphate, K_2SO_4 *(sulphate of potash)*, is found in a mineral *kainit* (K_2SO_4. $MgSO_4$. $MgCl_2$. $6H_2O$) in many salt mines, more particularly in the celebrated salt mines of Stassfurt, in Saxony. It is also a by-product of several chemical works, and is used in the manufacture of alum, and in very large quantities as an artificial manure.

Potassium nitrate, KNO_3 *(saltpetre or nitre)*, is found in the soil in many localities in India, Egypt, Hungary, &c., being produced by the decomposition

(nitrification) of organic substances rich in nitrogen in the presence of potash salts. The natural process is imitated in the *nitre plantations*, where heaps are formed of manure and other nitrogenous substances, mixed with lime, wood ashes, and soil, and which are kept moist with the drainage from stables.

On a large scale saltpetre is prepared by the chemical decomposition of the much cheaper *sodium nitrate* or *Chili saltpetre* with potassium chloride, derived from salt mines:

$$NaNO_3 + KCl = NaCl + KNO_3.$$

Saltpetre forms colourless, prismatic crystals, which are easily soluble in water, more particularly in boiling water. Saltpetre exposed to the air keeps dry, and does not absorb moisture like Chili saltpetre. Saltpetre, when heated, melts, and at red heat gives off oxygen.

Saltpetre is chiefly used in the manufacture of gunpowder and fireworks. Black gunpowder is a mixture of charcoal, sulphur, and saltpetre, containing roughly from 74 to 75 parts of KNO_3, 10 parts of S, and 14 to 15 parts charcoal.

Nitre is generally used in the preparation of pickling salts and fluids for the preserving and corning of meat. A good *pickling brine* is prepared by dissolving in 10 gallons of boiling water 15 lb. of common salt, $\frac{1}{4}$-lb. of saltpetre, and $2\frac{1}{2}$ lb. of sugar.

On account of its high price, saltpetre is rarely used as a manure, although it is highly valuable, as it supplies both nitrogen and potash to the plants.

Potassium chloride, KCl, is found in the ashes of sea-weeds (*kelp*) and in the molasses of beetroot sugar. It is also found combined with magnesium chloride in the mineral *Carnallite*, $KCl.MgCl_2.6H_2O$, of which enormous deposits exist in Stassfurt. It is used as a manure and in the manufacture of saltpetre.

Potassium salts are easily distinguished by the peculiar violet colour imparted to a flame. This can be shown by adding a little of solution of saltpetre to methylated spirit; the mixture will burn with a peculiar lilac flame—or, again, by bringing a little of a potash salt on a platinum wire into a blowpipe flame *(Experiment 54)*. Should a sodium salt be present, the strong yellow sodium flame may disguise the violet colouration of the potash, but this again may be made visible by looking at the flame through a dark-blue glass (cobalt glass). With a solution of platinic chloride, potassium salts form a yellow crystalline precipitate, soluble in water but insoluble in alcohol, which is used for the quantitative determination of potash *(Experiment 55)*.

Potassium is absolutely indispensable to plant and animal life, and no cell can live without traces of potassium salts. What part potash really plays in the assimilation is still unknown, but it seems particularly necessary in the production of the carbo-hydrates. Marine plants generally contain less potash salts in their ashes than plants grown on land. Certain plants, like tobacco, cabbage, turnips, beet, and potatoes, require large amounts of potash. The sap of most plants contains potash salts of oxalic, citric, malic, and tartaric acids. Potassium phosphates are found in the seeds and silicates in the leaves of grasses and sedges. Large amounts of potassium salts are found in the flesh, brains, and liver. The red blood corpuscles contain ten times more potash salts than the blood serum.

Sodium (Na—from Natrium), like potassium sodium, is widely distributed in Nature, and is found in many minerals. Large quantities of the chloride—*common salt*—are found dissolved in sea-water, and solid in the form of crystals in rock salt.

Sodium is a metal closely resembling potassium in its properties. Sodium salts colour the flame intense yellow *(Experiment 56)*.

As sodium is so closely related to potassium, it is nearly always found in plant ashes, but generally in smaller quantities. Some cultivated plants—as, for instance, asparagus, lettuce, spinach, and sugar-beets—contain frequently large amounts of sodium salts, and seem often to profit by application of

manures containing soda salts. Still, sodium cannot be called an indispensable constituent of plant foods, and, although so closely related chemically to potassium, it cannot replace the latter as a plant food. Sodium salts, however, seem to be a necessary constituent of the food of animals.

Sodium hydroxide, NaOH (*caustic soda*), resembles closely the potash compound, and is similarly prepared. It is used in manufacture of soap and paper.

Sodium chloride, NaCl, or *common salt*, is found in solution in sea-water and as rock-salt in salt mines. Salt may be obtained from sea-water by allowing it to evaporate in large shallow pools. From the salt mines the salt, if sufficiently pure, may be obtained by direct mining—as, for instance, in the large salt mines at Northwick, in Cheshire—or, again, in the old celebrated mine at Wielitzka, in Poland. In other places, the salt is extracted with water and evaporating the strong brine obtained.

Salt crystallises in colourless cubical crystals. The presence of impurities, particularly of magnesium chloride and calcium chloride, in salt causes the salt to become moist in damp weather.

Salt is a regular constituent of blood, and is also found in the saliva and gastric juices. Sodium chloride is a necessary article of food for man and animals, and about 20 lb. of salt are used annually, directly and indirectly, per head of population. A direct use of salt as addition to food is particularly required in the case of a more vegetable diet; a meat diet requires less salt. Salt taken in large quantities retards the digestion, and the large amount of salt in the blood serum, about $\frac{1}{2}$ per cent., is one of the principal causes which prevents the stomach of digesting itself.

Enormous quantities of salt are used in chemical manufactures, particularly in the production of washing soda, hydrochloric acid, and chlorine gas.

Sodium carbonate, Na_2CO_3, *washing soda*, $Na_2CO_3 + 10H_2O$, is prepared from salt by three different processes of an important chemical industry.

The oldest or *Leblanc process* consists briefly in treating of sodium chloride with sulphuric acid to form sodium sulphate in the form of *salt cake*—

$$2NaCl + H_2SO_4 = Na_2SO_4 + 2HCl.$$

The salt cake is mixed with limestone and coal, and heated in large furnaces, producing a mixture of soda carbonate and calcium sulphide, known as *black ash*—

$$Na_2SO_4 + CaCO_3 + 2C = Na_2CO_3 + CaS + 2CO_2.$$

Finally, the black ash is extracted with water, and the solution of sodium carbonate (*tank liquor*) purified and concentrated by evaporation.

The second or *ammonia-soda process*, also called *Solvay process*, is based on the decomposition of bicarbonate of ammonia by strong brine—

$$H(NH_4)CO_3 + NaCl = HNaCO_3 + NH_4Cl.$$

The brine is first saturated with ammonia gas, and cooled and charged with carbonic acid gas; the bicarbonate of soda formed, being much less soluble, separates out, and is converted by simple calcining into the carbonate—

$$2HNaCO_3 = Na_2CO_3 + H_2O + CO_2.$$

The newest process of soda manufacture is the *electrolytic process* (Hargreaves-Bird), in which a concentrated solution of brine by the help of an electric current is separated into chlorine and sodium. The liberated sodium acts at once on water forming the hydroxide, and this is changed by a stream of carbonic acid gas into the carbonate.

From the chemical formula of washing soda it will be seen that it contains 10 molecules of water, equal to about 63 per cent. of water. Part of this water is given off at ordinary temperature; the crystals become covered with a fine powder (they effloresce). When heated, the crystals fuse, give off water, and finally, by continuing the heating all the water may be driven off, and *anhydrous sodium carbonate* is obtained.

Hydrogen sodium carbonate, Bicarbonate of soda, $NaHCO_3$ *(baking soda)*, may be prepared by passing carbonic acid gas over moist soda crystals—

$$Na_2CO_3.10H_2O + CO_2 = 2HNaCO_3 + 9H_2O.$$

This salt is used in baking powders and in the preparation of Seidlitz powders.

Sodium nitrate, $NaNO_3$, *Chili saltpetre* or *cubical saltpetre*, is, as the name indicates, largely found in rainless localities in Chili and also in Peru. It is largely used as a very valuable nitrogenous manure, and also in the manufacture of potassium nitrate and of nitric acid. Exposed to the air, the salt absorbs moisture, and for this reason cannot be used as a substitute for potassium nitrate in the manufacture of gunpowder.

APPENDIX TO SEVENTH LESSON.

Specific gravity of a liquid or a solid is its weight as compared with that of an equal volume of water at a temperature of 60° Fahr. As the density of all bodies varies with the temperature, the comparison must be made at a certain normal temperature.

Alkali metals, a family group of five elements, all univalent, which are all found in various plants, although some of them in very minute quantities. They are—

	Atomic Weight.	Melting Point.
Lithium (Li)	7. ...	180° C.
Sodium (Na)	23. ...	95.6
Potassium (K)	39. ...	62.5
Rubidium (Rb)	85. ...	38.5
Caesium (Cs)	133. ...	26.5

The *gradation* of properties in this group is very marked. The melting point decreases as the atomic weight rises; the chemical activity increases with an increase of the atomic weight. Lithium has the highest decomposing action on water, Caesium the least. The carbonates of K, Rb, and Cs are highly deliquescent, absorb moisture from the air, and are very soluble in water. Sodium carbonate does not deliquesce, but is still very soluble, whereas Lithium carbonate is only sparingly soluble. The phosphates show similar properties, and Lithium phosphate is sparingly soluble. The normal phosphates of all other metals are insoluble.

Alkali is a term used since remote periods denoting salts obtained by treating ashes of certain plants—principally marine plants, called *kali*—with water.

Experiment 53.—Boil a little tallow, oil, or butter, or any other fat, with a little caustic potash solution; show that on cooling no fat separates out. Add a few drops of the solution to rain water in a test tube; on shaking the tube, froth will be produced. When adding an acid to the solution a curdy precipitate of fatty acid will be produced, which on heating will melt.

Experiment 54.—Show the potassium flame by burning methylated spirits containing a little solution of saltpetre, or, again, by introducing some saltpetre on a platinum wire into the blowpipe flame.

Experiment 55.—Add a few drops of platinic chloride solution to a small quantity of a fairly concentrated solution of potassium chloride; a yellow precipitate will be formed. The precipitate forms only in moderately strong solution, but is hastened by the addition of alcohol.

Experiment 56.—Show the soda flame in similar manner as described in *Experiment 54*, and also make mixtures of soda and potash salts, and look at the flame through a cobalt-blue glass.

The principal salts of the elements should be kept in stock in small quantities to show to the pupils, and many interesting experiments can be made in preparation and crystallisation of the metallic salts.

QUESTIONS TO THE SEVENTH LESSON.

1. What are the characteristic differences between metallic and non-metallic elements?
2. What are the properties of light and of heavy metals?
3. Which are the most important groups of metals belonging to the light metals?
4. Which rocks are particularly rich in potash?
5. Why are alkali metals generally preserved under naphtha?
6. How is caustic potash prepared on a large scale?
7. In which way shows caustic potash to possess powerful alkaline properties?

8. Are all metallic oxides bases? What other oxides exist?
9. By what tests can the presence of potassium in a salt be proved?
10. Are potassium salts necessary to plant life?
11. What plants require particularly potash manures?
12. Can sodium salts, which resemble the potassium salts so closely in all respects, replace the latter in manures?
13. Which plants, if any, are benefited by a manure containing sodium salts?
14. What are the chief uses of sodium chloride?
15. How is washing soda manufactured?
16. What is the difference between washing soda and baking soda?
17. How can saltpetre be obtained artificially?
18. Which saltpetre will contain more nitrogen potassium or sodium saltpetre? How would you calculate the percentage of nitrogen in Chili saltpetre containing 6 per cent. of impurities, if Na = 23, N = 14, and O = 16? (Answer, 15.48 per cent.)

Times of Sunrise and Sunset, 1906.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·58	6·46	5·22	6·42	5·42	6·19	5·59	5·46
2	4·58	6·46	5·22	6·42	5·43	6·18	5·59	5·45
3	4·59	6·46	5·23	6·41	5·43	6·17	6·0	5·44
4	5·0	6·46	5·24	6·41	5·44	6·16	6·0	5·43
5	5·1	6·47	5·24	6·40	5·44	6·15	6·0	5·42
6	5·2	6·47	5·25	6·40	5·45	6·14	6·1	5·41
7	5·2	6·47	5·26	6·39	5·45	6·13	6·1	5·40
8	5·3	6·47	5·27	6·38	5·46	6·12	6·2	5·39
9	5·3	6·47	5·28	6·37	5·46	6·11	6·2	5·38
10	5·4	6·48	5·28	6·36	5·47	6·10	6·3	5·37
11	5·4	6·48	5·29	6·35	5·47	6·8	6·3	5·36
12	5·5	6·47	5·30	6·35	5·48	6·7	6·4	5·35
13	5·6	6·47	5·31	6·34	5·49	6·6	6·4	5·34
14	5·7	6·47	5·32	6·34	5·50	6·5	6·5	5·33
15	5·8	6·47	5·32	6·33	5·50	6·4	6·5	5·32
16	5·9	6·46	5·33	6·32	5·51	6·3	6·6	5·31
17	5·10	6·46	5·34	6·31	5·51	6·2	6·6	5·30
18	5·11	6·46	5·34	6·30	5·52	6·1	6·7	5·29
19	5·11	6·46	5·35	6·29	5·52	6·0	6·7	5·28
20	5·12	6·46	5·36	6·28	5·53	5·58	6·8	5·27
21	5·12	6·46	5·36	6·27	5·53	5·57	6·8	5·26
22	5·13	6·46	5·37	6·26	5·54	5·56	6·9	5·25
23	5·14	6·45	5·38	6·25	5·54	5·55	6·9	5·24
24	5·15	6·45	5·39	6·24	5·55	5·54	6·10	5·23
25	5·16	6·44	5·40	6·23	5·55	5·53	6·10	5·22
26	5·17	6·44	5·40	6·22	5·56	5·52	6·11	5·21
27	5·18	6·44	5·41	6·21	5·56	5·51	6·11	5·20
28	5·19	6·43	5·41	6·20	5·57	5·50	6·12	5·19
29	5·20	6·43	...	...	5·57	5·49	6·13	5·18
30	5·20	6·42	...	...	5·58	5·48	6·13	5·17
31	5·21	6·42	...	...	5·58	5·47	...	...

PHASES OF THE MOON.

Date		Phase	H.	M.	
2 Jan.	☾	First Quarter	12	52	p.m.
10 „	○	Full Moon	2	36	„
17 „	☽	Last Quarter	6	48	„
24 „	●	New Moon	3	9	„
1 Feb.	☾	First Quarter	10	30	a.m.
9 „	○	Full Moon	5	45	„
16 „	☽	Last Quarter	2	22	„
23 „	●	New Moon	5	57	„
3 Mar.	☾	First Quarter	7	28	a.m.
10 „	○	Full Moon	6	17	p.m.
17 „	☽	Last Quarter	9	57	a.m.
24 „	●	New Moon	9	51	p.m.
2 April	☾	First Quarter	2	2	a.m.
9 „	○	Full Moon	4	12	„
15 „	☽	Last Quarter	6	36	p.m.
23 „	●	New Moon	2	6	„

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1906.		Rockhampton.		Townsville.		Cooktown.	
		Rise.	Set.	Rise.	Set.	Rise.	Set.
January	...	18 m.	2 m.	42 m.	12 m.	53 m.	9 m.
February	...	15 m.	5 m.	36 m.	18 m.	44 m.	18 m.
March	1 to 20...	11 m.	9 m.	29 m.	25 m.	35 m.	27 m.
„	21 to 31...	9 m.	11 m.	28 m.	26 m.	29 m.	33 m.
April	...	7 m.	13 m.	20 m.	34 m.	21 m.	41 m.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1904.		1905.										
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
North.													
Bowen	0·16	4·33	22·69	0·50	1·17	5·72	0·74	0·53	0·39	0·06	4·03	0·05	3·91
Cairns	0·42	7·88	25·74	8·59	6·81	6·92	3·89	1·94	0·43	2·27	Nil	0·46	1·72
Geraldton	1·18	7·35	28·37	5·71	8·26	20·51	13·35	9·39	2·41	3·88	Nil	0·22	5·44
Herberton	1·15	2·06	7·39	3·37	0·75	2·41	2·67	1·17	0·05	0·89	Nil	0·21	1·69
Hughenden	1·76	0·28	3·37	0·07	0·70	3·84	Nil	0·41	0·47	Nil	Nil	0·13	0·07
Kamerunga	0·43	11·62	29·08	7·56	4·38	8·89	5·63	2·59	1·11	2·16	Nil	0·63	1·05
Longreach	0·72	1·34	1·17	0·53	0·17	2·41	Nil	Nil	0·22	Nil	Nil	0·06	0·77
Lucinda	0·50	2·10	15·40	1·68	2·79	23·06	3·15	1·92	4·14	0·89	0·15	0·68	2·03
Mackay	Nil	1·52	29·89	4 73	3·67	13·19	2·17	1·82	0·95	0·66	0·97	0·08	2·45
Rockhampton	1·32	1·60	15·39	0·92	0·09	8·93	0·95	0·54	0·26	0·51	0·70	0·91	1·05
Townsville	1·17	5·70	13·71	1·97	2·02	6·41	0·52	0·35	0·68	0·06	...	0·52	0·19
South.													
Barcaldine	1·02	6·54	1·85	0·12	0·25	1·56	Nil	Nil	0·30	0·04	Nil	0·15	1·49
Beenleigh	4·43	4·55	5·44	3·04	2·91	3·63	2·21	0·40	0·27	1·12	1·15	2·82	*
Biggenden	1·08	5·89	13·05	1·94	3·61	3·81	1·46	0·60	0·28	0·10	0·79	2·56	1·14
Blackall	0·53	5·04	3·19	0·23	2·34	5·02	0·21	Nil	0·68	0·04	Nil	0·29	1·45
Brisbane	2·36	3·65	9·09	2·64	2·65	4·50	1·10	0·39	0·28	0·65	1·32	2·22	3·63
Bundaberg	0·16	5·16	16·67	2·17	3·35	6·31	4·26	1·10	0·71	0·17	0·95	2·37	0·95
Caboolture	3·07	7·36	8·10	3·43	3·57	4·89	1·65	0·26	0·05	0·36	0·98	2·73	2·88
Charleville	0·09	2·51	1·70	0·73	1·67	3·87	0·63	0·01	0·15	0·14	0·09	0·99	0·68
Dalby	2·59	2·15	3·40	0·74	5·46	3·09	2·19	0·25	1·15	0·76	0·14	2·09	1·60
Emerald	2·43	2·44	7·77	0·25	1·76	6·00	0·72	0·06	0·50	0·30	0·29	0·64	4·41
Esk	2·90	3·07	8·26	0·85	1·87	3·52	1·68	0·33	0·52	0·57	0·65	3·21	3·65
Gatton College ...	1·14	2·42	5·57	1·10	1·71	4·22	2·56	0·26	0·98	0·27	0·54	2·59	3·59
Gayndah	0·67	2·36	11·34	0·82	1·58	4·06	1·07	0·42	0·54	0·25	0·30	2·38	1·52
Gindie	1·55	2·02	7·07	0·06	1·74	7·44	0·41	0·11	0·37	0·09	Nil	1·11	3·79
Goondiwindi	1·61	1·62	3·37	0·87	2·53	6·49	1·23	0·55	0·52	0·58	Nil	3·57	1·51
Gympie	2·55	3·94	9·75	2·29	2·00	7·05	4·49	0·79	0·78	0·70	1·85	1·48	1·44
Ipswich	1·62	4·25	6·87	1·30	1·85	2·86	1·98	0·50	0·44	0·78	0·70	2·91	3·32
Laidley	3·99	5·26	9·93	2·33	2·17	4·11	2·59	0·56	0·56	0·61	0·30	2·36	3·59
Maryborough	2·62	2·33	20·69	2·67	2·78	3·48	3·56	1·21	0·07	0·26	1·04	2·48	0·70
Nambour	2·08	7·54	13·50	5·38	3·58	6·65	4·79	1·36	0·05	0·83	1·62	4·70	0·85
Nerang	2·39	3·85	4·95	4·99	5·61	8·98	3·63	0·61	0·27	1·55	1·04	4·59	2·21
Roma	0·03	1·76	2·65	1·74	1·44	2·92	1·72	0·21	0·35	0·31	0·15	1·02	2·15
Stanthorpe	1·92	5·00	3·04	0·37	5·29	2·64	1·63	1·01	0·63	1·77	0·28	3·48	1·94
Tambo	0·80	3·90	3·54	1·34	2·54	5·12	0·12	0·06	0·36	0·16	Nil	0·85	1·57
Taroom	1·73	2·92	3·25	1·63	2·73	6·17	2·22	0·33	0·67	0·31	Nil	0·76	1·11
Tewantin	1·93	7·61	11·79	2·91	3·64	12·43	10·01	2·06	0·22	0·55	1·29	6·57	1·28
Texas	0·76	2·97	3·77	0·09	2·47	3·78	3·07	0·80	0·53	1·09	0·16	3·54	0·94
Toowoomba	2·26	2·75	4·50	1·91	4·17	5·27	3·69	0·65	1·01	0·66	0·61	2·59	2·09
Warwick	1·92	3·65	1·52	1·28	6·20	2·06	2·18	0·77	0·26	1·01	0·41	4·00	2·16
Westbrook	3·37	3·65	2·46	0·57	2·00	1·24	2·54	0·46	0·71	0·61	1·23	2·60	3·62

* Return not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian (salted): Victorian, 114s. to 116s.; New South Wales, 114s. to 116s.; Queensland, 112s. to 114s.; New Zealand, 116s. to 118s. Danish, 116s. to 118s. per cwt. Unsalted, 1s. lower.

CHEESE.—Canadian, 62s. to 65s.; New Zealand, 61s. to 63s. per cwt.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £17 to £18; raw, £14 to £18 per ton; German beet, 88 per cent., 9s. 7½d. per cwt.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—5s. to 9s. per cwt.

RICE.—Real Carolina, £24 to £28; Rangoon, £9 to £12; Japan, £13 to £17 10s.; Java, £17 to £20; Patna, £15 to £17 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 50s. to 125s.; peaberry, 50s. to 105s.; Santos, 40s. to 57s.; Jamaica, 110s. to 130s. per cwt.

CHICORY ROOT, DRIED (duty paid).—24s. to 25s. per cwt.

ARROWROOT.—St. Vincent, 1¾d. to 3½d.; Natal, 3d. to 4½d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

WHEAT.—Duluth, 34s. 3d. to 34s. 6d. per 496 lb.; English, 30s. 4d. to 32s. 2d. per 504 lb.; Australian, 32s. to 34s. 6d. per 480 lb.

FLOUR.—Australian, 26s. per 280 lb.

MALTING BARLEY.—28s. to 34s. per 448 lb.; grinding, 18s. 9d. to 26s. per 416 lb.

OATS.—New Zealand, 17s. to 17s. 6d.

SPLIT PEAS.—40s. to 50s. per 504 lb.

GINGER.—Jamaica, 42s. to 70s.; Cochin, 42s. to 70s.; Japan, 18s. to 18s. 6d. per cwt.

VANILLA.—7½ to 8½ in., 6s. to 11s.; 7 to 7½ in., 4s. to 8s. 6d.; 3 to 6 in., 3s. to 5s.; splits, 3s. to 5s. per lb.

PEPPER.—Capsicums, 14s. to 60s.; chillies, 33s. to 37s. per cwt.; black, 5½d.; white, 8d. per lb.

RUBBER.—3s. 10d. to 5s. 4d.; Ceylon "biscuits," 6s. 4d. per lb.

GREEN FRUIT.—Apples: Australian, no quotation; American, 20s. to 32s.; Canadian, 17s. to 21s. 1d. per case; bananas, per bunch, 6s. to 10s.; pineapples, 2s. to 5s. each. Oranges, Valencia, per 420, common, 10s. to 11s.; medium, 13s. to 14s.; fine selected, 14s. to 16s.; finest selected, 16s. to 22s. Lemons, Naples, per 360, ordinary to fine, 16s. to 22s.; finest selected, 36s. to 40s. Grapes, 10s. to 26s. per barrel.

DATES.—Tafilat, 75s. to 80s.; Egyptian, 27s. to 28s. per cwt.; Persian, 11s. to 13s. 6d. per case.

COTTON.—Uplands, 6½d. to 7d.; Sea Island, 15½d. to 16d. per lb.

COTTON SEED.—£5 to £5 10s. per ton.

COTTON-SEED OIL.—Crude, £15 10s.; refined, £16 to £18 10s. per ton.

COTTON-SEED OIL CAKE.—Decorticated, £7 to £7 10s. per ton.

COTTON WASTE.—In 5-cwt. bag bales, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

LINSEED.—40s. per qr.

LINSEED OIL.—£17 12s. 6d. to £17 15s. per ton.

LINSEED OIL CAKE.—£7 10s. to £8 2s. 6d. per ton.

OLIVE OIL.—£37 to £41 per tun (252 gallons).

COPRA (cocoanut-kernel).—£16 10s. to £17 per ton; £11 to £11 2s. 6d. at the S.S. Island trading stations. Corresponding value in Queensland, £12 to £14 per ton.

COCOANUT OIL.—£28 10s. to £34 per ton.

BEESWAX.—Australian, £7 to £7 10s. per cwt.

LUCERNE SEED.—60s. to 68s. per cwt.

CANARY SEED.—66s. to 80s. per quarter of 480 lb. = 8s. 3d. to 10s. per bushel.

HONEY.—17s. to 26s. 6d. per cwt.

MANILA HEMP.—
SISAL HEMP.— } The hemp market is very firm, and prices are well maintained for all classes of hemp.

NEW ZEALAND HEMP AND FLAX are quoted at £31 5s. and £48 to £52 per ton respectively.

TAPIOCA (duty, 5d. per cwt.).—1½d. to 2d. per lb.; pearl, 12s. to 18s. per cwt.

EGGS.—French, 12s. to 15s. 6d.; Danish, 12s. to 16s. per 120.

BACON.—Irish, 57s. to 66s.; American, 35s. to 54s.; Canadian, 56s. to 60s. per cwt.

HAMS.—Irish, 86s. to 112s.; American, 48s. to 56s. per cwt.

TALLOW.—Mutton, fine, 34s.; medium, 28s.; beef, fine, 30s. 6d.; medium, 27s. per cwt.

POULTRY (Smithfield).—Good supplies, but only a moderate demand. Prices: Ducks, 2s. to 3s.; geese, 5s. to 6s.; Surrey fowls, 2s. 6d. to 3s. 6d.; Lincolnshire fowls, 2s. to 2s. 6d.; Essex fowls, 2s. to 2s. 9d.; Irish fowls, 1s. 9d. to 2s.; Russian fowls, 1s. 9d. each; English hares, 2s. 6d. to 3s.; leverets, 1s. 9d. to 2s.; Scottish hares, 1s. 4d. to 1s. 6d.; wild rabbits, 8d. to 11d. each; Australian rabbits, 6s. to 7s. 6d. per dozen.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	Dec. 30.	Jan. 6.
New Zealand Sheep. (Crossbred Wethers and Merino Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{4}$d.
Canterbury, medium (56 lb. to 64 lb.)	4d.	$4\frac{1}{8}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$3\frac{1}{8}$d.	4d.
Dunedin and Southland (56 lb. to 64 lb.)	None offering.	
North Island (56 lb. to 65 lb.), ordinary	$3\frac{7}{8}$d.	$3\frac{15}{16}$d.
North Island, best	4d.	$4\frac{1}{16}$d.
Australian Sheep. (Crossbred and Merino Ewes.)		
Heavy (over 50 lb.)	$2\frac{7}{8}$d.	$2\frac{7}{8}$d.
Light (under 50 lb.)	$3\frac{1}{8}$d.	$3\frac{1}{8}$d.
River Plate Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{1}{8}$d.	$3\frac{1}{8}$d.
Light (under 50 lb.)	$3\frac{1}{4}$d.	$3\frac{1}{4}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	$4\frac{1}{2}$d.	$4\frac{1}{2}$d.
Canterbury, heavy (36 lb. to 42 lb.)	$4\frac{1}{2}$d.	$4\frac{1}{2}$d.
Dunedin and Southland (28 lb. to 42 lb.)	None offering.	
North Island (28 lb. to 42 lb.) ...	None offering.	
Australian Lambs.		
30 lb. to 40 lb., first quality ...	$4\frac{1}{4}$d.	$4\frac{3}{8}$d.
30 lb. to 40 lb., second quality ...	$3\frac{3}{4}$d.	$3\frac{3}{4}$d.
River Plate Lambs.		
30 lb. to 40 lb.	None offering.	
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{7}{8}$d.	$2\frac{7}{8}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{3}{8}$d.	$3\frac{3}{8}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (160 lb. to 220 lb.) ...	3d.	3d.
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{3}{4}$d.	$2\frac{3}{4}$d.
Ox, hinds (160 lb. to 220 lb.) ...	3d.	3d.

QUEENSLAND TIMBER.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the English market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand. Ivory wood should be carefully preserved from destruction.

General Notes.

HARNESSING TO A CART.

We know that the fore legs, shoulders, and fore feet are worn out sooner and suffer more than the hind legs, loins, and hind feet. Now this is entirely due to the manner in which the horse is yoked to the cart. Instead of the line of force coming straight from the shoulder to the cart, let it come from the sides of the chest to the cart. Then the fore legs will be free from the strain and pull of the load, the feet will not be put down with the same concussion, and the shoulders will not be held down so rigidly by the collar, but they will move with more ease and freedom at every step.

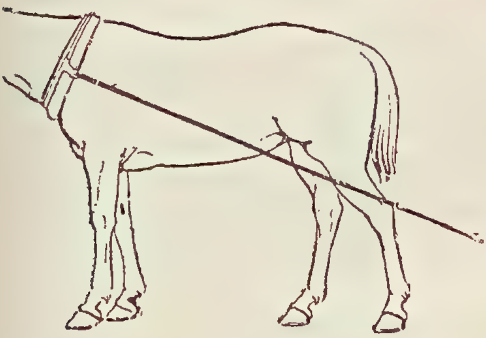


FIG. 1.

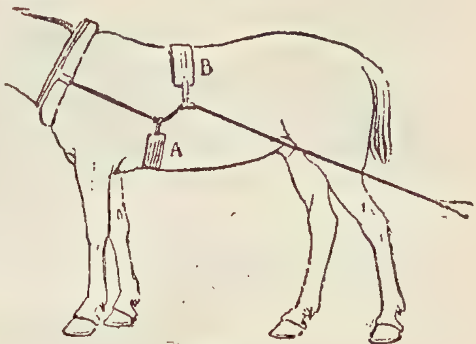


FIG. 2.

Drawing No. 1 shows the fault exaggerated by placing the attachment of the trace very low. The position of the trace in Fig. 1 tends to keep the fore feet held down, and an awful strain on the shoulder blades, which are an extension of the leg, and should not be retarded from free movement.

Fig. 2 takes the strain off the shoulder, and the downward pull of the trace does not come directly upon the forelegs as in Fig. 1; consequently the concussion of the fore feet cannot be as much when going along.

The two bands, A and B, take some of the load off the collar, for if the pull on the trace is 100 lb. then the pull on the collar would be, say, 60 lb.—"Agricultural Gazette."

AN OLD REMEDY FOR PHYLLOXERA.

Some few years ago the proprietor of a vineyard at Ivigany, in the Department of the Rhone, France, bethought himself of introducing strawberry plants between the rows of vines. The strawberry plants selected were of a kind which produces very large berries, because these berries either engender or attract an insect that takes pleasure in seeking out, pursuing, and devouring the phylloxera insects. It was like setting one pest to destroy another. The plan was said to be amazingly successful. The strawberry insect sought out and killed the vine insect on so sweeping a scale that, very soon, the phylloxera was destroyed, and the vines were left in peace to ripen their grapes to perfection. This ingenious device has since been followed by other vinegrowers with equal success, and we are told that their vines have been perfectly healthy since the strawberry plants have been introduced into their midst. We have fortunately as yet not suffered in Queensland from the terrible pest of the phylloxera; still, as there is no knowing what may happen in the future, it is well to be prepared with all information which may tend to fend off possible insect pests in vineyard and orchard. We are not aware whether the strawberry remedy has been tried in the southern States of the Commonwealth, where phylloxera has done considerable injury to the vineyards. If not, the remedy is so simple that it would be well worth a trial even if no good results followed.

VITALITY OF TOMATO SEEDS.

Mr. F. G. Walker, Sherwood Orangery, Coomera River, has given us a well-authenticated account of some seeds of the yellow tomato which he sent to a friend in London, who is a horticulturist, some years ago. The latter gentleman writes:—"I think I told you that, in addition to the new stock of yellow tomatoes you were so good as to send me, I have been so fortunate as to recover the old breed. What a wonderful vitality those seeds must have! Out of five or six I found sticking to the old papers, three germinated, yet they must have been over twenty-five years old—in fact, I think more than thirty years."

Mr. Walker says he remembers the date well when he sent the seeds to his friend's late father. This was thirty-four years ago. They were very much valued, and were continuously grown under glass for many years. Yet people here destroy tomato seed two years old as being too risky to plant.

ORANGE MARMALADE.

The same correspondent in London has something to say about oranges and orange marmalade. "If," he says, "you had succeeded in your attempts to get oranges over, they ought to have made a good price. Notwithstanding what you told me some time ago about oranges not being used for marmalade, I still think there is an opportunity there. In this country, all the best establishments, private houses, and even hotels, make the marmalade for their own consumption, because they will not use the cheap rubbish produced by the manufacturers and put on the market as 'marmalade,' not 'orange' marmalade at all."

SISAL FIBRE MANUFACTURES.

During the holiday season there have been exhibited in the windows of Messrs. Perry Brothers' establishment, Queen street, a quantity of articles manufactured from sisal fibre, grown and prepared at H.M. Penal Establishment at St. Helena. These comprise rope, binder twine, clothes lines, and two kinds of 2 and 3 cord twine for sewing bales and packages. The raw material was also shown. The beauty of these manufactures, which are the work of Mr. Forsyth's ropeworks at Kangaroo Point, have attracted large numbers of visitors, who expressed their admiration of the exhibits. The binder twine naturally came in for criticism by wheat farmers who were in town during the holidays, and they consider it much superior to the usual Manila twine, so much so that they would be willing to pay more for the sisal twine than for the latter.

It is true that very great care has been exercised in cleaning the fibre at St. Helena, resulting in a far more clean and lustrous fibre than any imported from oversea, but even with ruder treatment the sisal fibre will hold its own with any other for lustre, strength, and elasticity. Unfortunately, the industry is only beginning in Queensland, and three or four years must elapse before the fibre can be placed on the market in commercial quantities. Meanwhile, we learn that other countries are starting in the race. So many new uses have been found for this valuable fibre, however, that those acquainted with the market for fibres hold out no prospect of a drop in prices.

Answers to Correspondents.

TROUBLE WITH HAND-FED COW.

JERSEY, Childers.—The case you mention is not at all of uncommon occurrence. Mr. Cory, M.R.C.V.S.L., veterinary officer of the Stock Department, says that several cases of the kind have come under his notice.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	DECEMBER. Prices.
Apples, Eating, per packer, Victorian (out of season) ...	...
Apples, Eating, per packer	6s. 6d. to 11s.
Apples, Cooking, per packer	5s. to 8s. 6d.
Apples, Local, per packer ...	3s. to 4s. 6d.
Apples, American, per packer	16s.
Apples, Cooking, per packer	5s. to 8s. 6d.
Apricots, quarter-case	...
Apricots, American, per 108's	...
Bananas, per bunch	6d. to 1s. 3d.
Bananas, per dozen	2d.
Cape Gooseberries, quart ...	...
Cherries, quarter-case	...
Comquats, case	...
Custard Apples, quarter-case	...
Grapes, per lb.	...
Granadillas, case	...
Gooseberries, English	...
Lemons, American, per case	...
Lemons, Sydney, per case...	...
Lemons, Italian, per case ...	...
Lemons, Italian, per 180 ...	...
Loquats, half-gincase	...
Mandarins, Local ...	...
Mandarins, Bowen ...	...
Mangoes, half-case ...	2s. 6d. to 6s.
Nectarines, quarter-case ...	...
Oranges, per packer	6s. to 11s.
Passion Fruit, quarter-case	2s. to 3s.
Papaw Apples, per case ...	3s.
Paspalum Seed, per lb. ...	9d. to 1s. 3d.
Peaches, half gin case	1s. 6d. to 3s. 6d.
Peanuts, per lb.	...
Pineapples (rough leaf), per dozen	10d. to 3s. 6d.
Pineapples (smooth leaf), per dozen	2s. to 5s.
Plums, Black, quarter-case	...
Plums, Light, quarter-case	...
Plums, American, per 108's	...
Quinces, quarter-case	...
Rosellas, per sugar-bag	...
Strawberries, per quart	4d. to 6d.
Tomatoes, quarter-case	6d. to 1s. 6d.
Watermelons, per dozen ...	4s. 6d. to 9s.

SOUTHERN FRUIT MARKET.

Bananas, per bunch	1s. 9d. to 3s. 6d.
Lemons, Queensland, per case	4s. to 5s.
Lemons, Messina, per double case	18s. to 21s.
Oranges	18s. to 20s.
Pineapples, double case ...	11s. to 13s.
Tomatoes, half-case	4s. to 4s. 6d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR DECEMBER.

Article.		DECEMBER. Prices.
Bacon (Pineapple)	lb.	6d. to 7½d.
Barley, Malting	bush.	3s. 2d. to 3s. 9d.
Bran	ton	£5 10s. to £6 5s.
Butter, Factory	lb.	9½d. to 11d.
Chaff, Mixed	ton	£3 15s. to £4.
Chaff, Oaten	"	£4 2s. 6d. to £4 10s.
Chaff, Lucerne	"	£4 3s. 9d. to £5.
Chaff, Wheaten	"	£2 5s. to £2 10s.
Cheese	lb.	5d. to 6½d.
Flour	ton	£8 12s. 6d.
Hay, Oaten	"	£5 13s. 9d. to £6 5s.
Hay, Lucerne	"	£3 6s. to £3 15s. 6d.
Honey	lb.	1¼d. to 2d.
Maize	bush.	4s. 11d. to 5s. 2d.
Oats	"	2s. 9d. to 3s. 8d.
Pollard	ton	£6 18s. 3d. to £7 8s.
Potatoes	"	£10 19s. to £13 9s.
Potatoes, Sweet	"	£2 10s. to £3.
Pumpkins	"	£3 15s. to £5.
Wheat, Milling	bush.	4s. to 4s. 3d.
Wheat, Chick	"	3s. 10d. to 4s. 1d.
Onions	ton	£7 3s. to £9 17s. 6d.
Hams	lb.	9d. to 10d.
Eggs	doz.	5¾d. to 9d.
Fowls	pair	1s. 10d. to 3s. 8d.
Geese	"	5s. 5d. to 6s. 6d.
Ducks, English	"	2s. 3d. to 2s. 9d.
Ducks, Muscovy	"	2s. 9d. to 3s. 9d.
Turkeys, Hens	"	5s. 4d. to 6s. 8d.
Turkeys, Gobblers	"	13s. to 18s.

ENOGGERA SALES.

Animal.	NOVEMBER. Prices.	DECEMBER. Prices.
Bullocks	£10 10s. to £12 2s. 6d.	£10 12s. 6d. to £13.
Cows	£8 5s. to £10 10s.	£9 15s. to £10 10s.
Merino Wethers	22s. 9d.	15s. 9d.
" Ewes	17s. 6d.	18s. 3d.
C.B. Wethers	22s. 9d.	25s.
" Ewes	17s. 6d.	17s. 6d.
Lambs	15s. 9d.	20s.
Pigs (very few)	...	...

Science.

WHAT EARTH WORMS DO FOR THE SOIL.

Worms add largely to the organic matter in the soil by the astonishing number of half-decayed leaves which they draw into their burrows to a depth of 2 or 3 inches. So writes Charles Darwin, L.L.D., &c., in his work on "The Formation of Vegetable Mould through the agency of Earth Worms."

In this State of Queensland we have earth worms which far exceed the great European lob worm. We have noticed in the Blackall Range earth worms from 12 to 24 inches in length and of corresponding thickness. Where these monstrous worms are numerous, it is next to impossible to grow crops such as cabbages, for instance, for no sooner has the young plant put forth its first succulent leaves than, not only a leaf, but the whole plant is seized on and dragged into the recesses of the worm's burrows. We have also observed the worms taking the leaves of young coffee plants off the stem. They do this for two reasons—one, for the purpose of obtaining food; the other for closing the mouths of their burrows and for lining the upper part. The leaves which they consume are moistened, torn into small shreds, partially digested, and intimately commingled with the soil, and it is this process which gives to vegetable mould its uniform dark tint.

Professor Darwin mentions a case in which several square yards on a lawn were swept clean, and, after two or three weeks, all the worm castings on the space were collected and dried. These were found to contain 0·35 of nitrogen. Now, this is from two to three times as much as we find in our ordinary arable surface soil; more than in our ordinary pasture surface soil, but less than in rich kitchen-garden mould. "Supposing," says Mr. Darwin, "a quantity of castings, equal to 10 tons in the dry state, were annually deposited on an acre; this would represent a manuring of 78 lb. of nitrogen per acre per annum, and this is very much more than the amount of nitrogen in the annual yield of hay per acre, if raised without any nitrogenous manure. Obviously, so far as the nitrogen in the castings is derived from surface growth or from surface soil, it is not a gain to the latter, but, so far as it is derived from below, it is a gain."

Worms, by the acids evolved from their bodies, aid directly in the chemical disintegration of rocks, but there is good reason to believe that they likewise act in a direct manner on smaller particles. All the species that swallow earth are furnished with gizzards, and these are lined with a thick chitinous membrane. Chitine is a peculiar substance containing nitrogen, characteristic of the skin of insects, and found also in the shell of crustaceans. Some worms have two gizzards, some four and five. In the same manner as gallinaceous and struthious birds—such as ostriches and emus—swallow stones to aid in the trituration of their food, so it appears to be with earth worms. They swallow small stones, beads, bits of glass, of brick, and of tiles, to aid their gizzards in crushing and grinding the earth which they so largely consume. Worms prepare the ground in an excellent manner for the growth of fibrous-rooted plants, and for seedlings of all kinds. They periodically expose the mould to the air, and sift it so that no stones larger than the particles they can swallow are left in it. They mingle the whole intimately together, like a gardener who prepares fine soil for his choicest plants. In this state it is well fitted to retain moisture, and to absorb all soluble substances, as well as for the process of nitrification. The bones of dead animals, the harder parts of insects, the shells of land molluscs, leaves, twigs, &c., are, before long, all buried beneath the accumulated castings of worms, and are thus brought in a more or less decayed state within reach of the roots of plants. Worms likewise drag an

infinite number of dead leaves and other parts of plants into their burrows, partly for the sake of plugging them up, and partly as food. These leaves are torn up, partly digested, saturated with the intestinal and urinary secretions, and are commingled with much earth. This earth forms the dark-coloured rich humus which almost everywhere covers the surface of the land. It is believed that worm burrows, which often penetrate the ground almost perpendicularly to a depth of 5 or 6 feet, materially aid in its drainage. They also allow the air to penetrate deeply into the ground. They facilitate the downward passage of roots of moderate size, and these will be nourished by the humus with which the burrows are lined. Many seeds owe their germination to having been covered by worm castings, and others buried to a considerable depth beneath accumulated castings lie dormant until, at some future time, they are accidentally uncovered and germinate. When we behold a wide, turf-covered expanse, we should remember that its smoothness, on which so much of its beauty depends, is mainly due to all irregularities having been slowly levelled by worms. It is a marvellous reflection that the whole of the superficial mould has passed, and will again pass, through the bodies of worms. The plough is one of the most ancient and most valuable of man's inventions; but, long before he existed, the land was, in fact, regularly ploughed, and still continues to be thus ploughed, by earth worms. It may be doubted whether there are many other animals which have played so important a part in the history of the world as have these lowly-organised creatures. Some other animals, however, still more lowly organised—namely, corals—have done far more conspicuous work in having constructed innumerable reefs and islands in the great oceans, but these are almost confined to the tropical zones.

The above is collated from Charles Darwin's most interesting work, "Vegetable Mould and Earth Worms."

Orchard Notes for February.

BY ALBERT H. BENSON.

As this month is usually a more or less wet one, especially in coastal Queensland, the cultivation of the orchard is apt to become somewhat neglected, owing to the inability of working the land; and a heavy crop of weeds of all kinds is the result. If possible, the weeds should be kept down when young by means of one or two horse cultivators fitted with surface-working knives; but, if the weather prevents this from being done, no great harm will take place if the weeds are mown down before they go to seed. The trash so obtained should be ploughed in, and will tend to maintain the supply of organic matter in the soil, and this, as has been stated frequently in this Journal, is of the greatest importance, as, besides rendering the soil more friable and easier to work, it increases the power of the soil to retain moisture, a most important consideration in a climate as changeable as this. In drier districts the orchard should receive good cultivation after every rain, as by this means the growth of weeds will be prevented and the greatest amount of moisture will be retained in the soil. In dry districts where irrigation is available, all citrus trees should receive a thorough soaking during the month, unless there has been a fall of several inches of rain, as a soaking now will carry the fruit on to maturity, provided that it is followed by cultivation.

In irrigating fruit trees, always give a watering, say equal to 4 inches of rain all over the orchard; as this is infinitely better than giving a number of surface waterings. One soaking irrigation saturates every part of the soil, and will last for two or three months if followed up by proper cultivation; but surface waterings dry up in a few days, and unless kept up do more harm than good. In many cases, surface waterings induce the growth of surface roots, and unless these surface roots are kept well supplied with moisture they will die off, and more harm than good will be done to the tree. On the other hand, when the land is well saturated, the roots strike down, and are therefore less likely to dry out or be affected by sudden changes. The marketing of fruit still continues an important branch of orchard work. The main crop of rough-leafed pines, besides mangoes and bananas, in the Southern coastal districts, as well as the later varieties of plums and apples in the Stanthorpe district, have to be disposed of. As stated in last month's notes, every care should be taken to place the fruit on the market in as neat and attractive a manner as possible, and to see when packing it that it is free from fruit fly, San José scale, or other disease. I am sorry to say that few growers realise the importance of proper packing, as a large proportion of the locally grown fruit that comes to market is put up in anything but an attractive form. Clean cases, even grading, and neat packing always take the eye of the buyer; and fruit so got up will pay the grower handsomely for the extra trouble he has been put to, and not only that, should the market be glutted, fruit so got up will always find a sale when other fruit marketed in a slovenly manner is unsaleable.

February is a good month for transplanting mangoes and other tropical and subtropical fruit. The ground should be in thorough order, and dull or showery days should be chosen for the work; if this care is taken, there will be little risk or failure. Plant mango seeds either in nursery row for working over next year, or, if seedlings are wanted, then in the position they are to occupy permanently. In selecting mango seeds for trees to stand permanently, choose none but those obtained from the very best fruit—fruit that is of fine flavour, large size, handsome appearance, as free as possible from fibre, as well as being a prolific variety and strong grower.

Budding of both citrus and deciduous trees can be continued during the month, and the nursery will require constant care to keep it free from weeds, to see that all ties are cut, and all buds properly started and tied up; as, unless the young tree is properly started and trained to a single stem in the nursery, the grower has considerable difficulty in getting it to grow into a decent tree when it is permanently planted out in the orchard.

Strawberry planting should commence during the month. The land, which should be a rich loam of moderately heavy texture, if possible, should be well prepared by thorough working to a depth of at least 12 inches. If the land is virgin scrub, no manure will be necessary; but if it has been under crop for some time it should receive either a good dressing of well-rotted farm manure or of a commercial fertiliser rich in phosphoric acid, potash, and nitrogen.

Choose moist, showery weather for planting strawberries, and take care to set out nothing but strong, healthy runners. If the land is dry at time of planting it will require irrigating, and this is best done by opening up a furrow in which the plants are to be set, and filling it with water. As soon as the ground has soaked up the water, set the plants in the furrow and cover them with the dry soil. This method of watering will be found far better than setting the plants in dry ground and watering afterwards; as the moisture is all at the roots of the plants, and the dry soil that is placed on the top acts as a mulch and prevents the soil from drying out. Where leaf blight is troublesome—viz., wherever the Marguerite is grown—all plants should have all old diseased leaves removed, and the crowns and young growth should be dipped

in Bordeaux mixture, taking care that the Bordeaux mixture is made from the best bluestone and not from an inferior article, as the cheap bluestones contain more or less sulphate of iron, and this will destroy the bulk of the plants dipped into a solution of which it forms a part.

The best strawberries to grow are—

1st, for early box berries—Aurie and Marguerite.

2nd, for mid-season box berries—Aurie, Marguerite, Federator, Pink's Prolific, and Trollope's Victoria.

3rd, for jam—Pink's Prolific, Trollope's Victoria, and Marguerite, though the latter has not the colour of the former.

Farm and Garden Notes for February.

FIELD.—During this month the land intended for potatoes should be ready for planting. Plant only small potatoes whole. If large potatoes are cut into setts, there is risk of their rotting, as the usual wet weather may be expected, with a hot, muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep, rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, kafir corn, imphee, sorghum, and vetches may be sown, but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop sow swede turnips and mangold wurzels.

KITCHEN GARDEN.—Make preparation for good crops of vegetables for the early winter by ploughing or digging all unoccupied ground, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, prepared as follows:—

Spread a layer of black soil on the ground; dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes and plaster (gypsum), so that the compound shall contain the following proportions:—Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel; plaster, 1½ bushels. Mix thoroughly, and a little before planting moisten the heap with water, or better still, with urine; cover with old mats, and let it lie till needed.

Sow French beans, butter beans, beet, carrot, turnips, radish, cabbages, cauliflowers, cress, peas. Should the weather be dry after January rains, give the plants a good soaking of water. Gather all fruit of cucumber, melon, French beans, and tomatoes to ensure the continued productiveness of the vines.

FLOWER GARDEN.—Thin out and tie up dahlias. Keep the weeds down; never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, asters, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemums, verbenas, petunias, pentstemons, &c. Dianthus sown now and planted out in March will bloom during the whole year, if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep. On the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should only be covered with fine soil to a depth equal to their own size—for instance, a sweet pea is about one-eighth of an inch in diameter; therefore cover it with one-eighth of an inch of soil.

Agriculture.

TEACHING AGRICULTURE IN SCHOOLS.

The latest move in the direction of affording instruction in Agriculture to the pupils of our State schools is the preliminary process of instructing the teachers of these schools at the Queensland Agricultural College, at Gatton. The success which has attended this new departure has been remarkable. No less than 100 teachers were eager to avail themselves of the opportunity afforded them by the Secretary for Agriculture to attend a course of practical and technical instruction in the various operations of the farm. They willingly sacrificed a large portion of their well-earned Christmas holidays for this purpose. Manifestly not much can be done in a short fortnight, but when men are anxious to learn, and are, from life-long habit, able to gather and store up useful knowledge, to be afterwards imparted to their young charges, we may be sure that the work done by them at the College will be most advantageous to the State.

In connection with this matter, it is well to note some remarks by prominent men in England at a meeting of the Farmers' Club, in London, in November last. A paper on "Rate-aided Education" was read by Mr. Crouch, in which he touched upon various subjects connected with the education of children in rural schools, especially dealing with the age at which children should be first taught the elements of agriculture, and the age at which country children should leave school, if intended for farm life. One speaker, Mr. Hasler, said, *inter alia:*—

"Then with regard to teaching agriculture in the schools, if the boy is to leave school at twelve years of age, which I hold he ought to be allowed to do, I do not see it is of much use teaching him agriculture before that time. I believe it is admitted on all hands now that you should not specialise with any boy until he is fifteen years of age. I believe that preparatory and public schools give exactly the same teaching to the boys until they are fifteen. Therefore, I say we cannot do very much good in teaching agriculture to boys until they are twelve years old. But there is no place where you can teach agriculture as well as on the farm."

Then an allusion was made to half-timers. "I have been a school manager now for forty years, bar six months, and I have always set my face against half-timers, and we have never had a half-timer in any school under my management. I hold that there is nothing so subversive of discipline in a school as half-timers in agricultural districts. I say, keep the boys until you have taught them the three Rs, and then let them go to work if they can find a job."

Mr. Hipwell said it appeared to him that the feeling in favour of boys going early on the land was practically unanimous, and, if unanimous, then it ought to be taken notice of by the Education Department. There was one celebrated instance in the general practice of the country in which boys are put at a very early age to learn what they have to do, and that instance was one of vital importance to the country—he meant, the officers of the Royal Navy. If a boy was going to be a doctor, or a lawyer, or a barrister, or a soldier, he was kept at school or college until he was fairly on in life; but if he was going into the Navy, he was sent there at thirteen years of age or a little more. That had been the case from time immemorial, and it was recognised by the Government of Great Britain as absolutely essential to the success of the Navy. The same thing applied, although it was in a humbler sphere of life, to the boy who was going to be an agricultural labourer. If the boy's education could be further carried on, either by means of the continuation schools, which they were very willing to attend, or by taking them

compulsorily back to school for a short period of the year, when they are not wanted on the land. But then children should be taken at an age when they can be taught what they are required to do, and not at an age when they cannot be taught.

Mr. Dymond, of the Board of Education, said: I should like to say, in the first place, how much I appreciate Mr. Crouch's paper. The point about which I should like to say a few words is, that as I understand he considers that the reason why the education in the schools has prepared children more for towns than for country life, is, that the children remain at school too long, and that he would like—and this has been supported by a speaker since—to see the children leave school when they are twelve years of age. I think there is another means by which we may make the education in the schools more suitable for training children for rural life, and that is, by adapting this rural education to the needs of rural life in the way that has been suggested by Lord Heneage.

There is so much that we can do. The arithmetic, for instance, in our schools, might very much more deal with the arithmetical problems that are always confronting us in our daily life in the country. Our geography, I think, should first of all deal with the geography of our own village—the soil, the land, the crops, and so on. Our nature study, in my opinion, should be based upon the observations of the children about the soil, and about the weeds that grow upon the land, about the insect pests, and birds, and so on. I think if we did this, we should find that our children were much better fitted for work in the country afterwards. I personally believe there is a certain amount of truth when people say that an interest in country pursuits is thereby aroused. What I believe also is, that in that way we should develop the intelligence of our children, and they would go out and learn about these things in their daily lives.

I should also go so far as to introduce into every school some practical subject, some subject that is of real use to the child afterwards, which he can turn into shillings and pence after he leaves school. I would not only confine it to teaching girls cookery; I would like to see the girls not alone able to cook when they leave school; but I would like to see them so educated that they could make a garment, and, in certain districts, the girls should be taught dairying, so that they would be able to help their mothers in the dairy when they left school. And for the boys, we might, in addition to teaching them gardening at school—and I think we ought to have a garden in connection with every rural school in the country—I think we might teach the boys, not only gardening, but something of the things which they can do out of doors, some of the farming operations, such as boys can do.

ASPARAGUS.

The best time to plant asparagus is during the months of June and July. The growing season commences in October, and extends right into March or April. The cultural conditions necessary to grow asparagus are of the simplest. The whole secret of success lies in the preparation of the beds and in a plentiful supply of well-rotted manure. Every farmer should have an asparagus bed, and he can accomplish this by carrying out the following simple instructions:—

As the asparagus plant will thrive thoroughly for a dozen years, and even much longer, the work of properly preparing the beds is worth doing well. This work should be completed about two months before planting, because asparagus likes the soil to lie closely together when it forms new roots. First, the beds must be ploughed as deeply as possible, or if the bed is to be formed in the vegetable garden trench the soil to a depth of 18 inches or 2 feet, and if the subsoil is stiff break it up in one case with the subsoil plough, in the other

with a pick. Then supply rich farm-yard manure—bones or bone dust—which must be well incorporated with the subsoil and turned under. Replace the top soil in the case of the garden bed, mixing it also freely with old horse or cow manure, adding bone dust, and, if far from the seaside, a little coarse salt. In field culture, draw drills 3 feet apart. In the garden the rows may be as close as 2 feet. The plants should be put in at intervals of from 12 to 18 inches. After planting, mulch the surface with stable or yard manure to a depth of from 6 to 9 inches. A liberal watering during a dry season will be advantageous, but if deeply mulched, watering will hardly be necessary.

Now, concerning the alternative methods of raising asparagus from seed and from crowns, as the roots are called. If seed be sown, they will require four seasons before the plants will be productive, but plants raised from seed are always the most robust, and durable, and are also the best croppers.

Seed should be sown in August, in rows 18 inches apart, at a depth of 2 inches. Let all the plants grow until they are large enough for forcing; then dig up every other row for that purpose, remove also all plants in the remaining rows which are closer than 18 inches to each other. The rows of permanent plants will now be 3 feet apart, under which conditions they will succeed remarkably well. The seed bed must, of course, be prepared as above directed. The plants which were removed may be planted out in other properly prepared ground. It is advisable, however, to plant strong roots in preference to sowing the seed, as these will afford a cutting in the second season after planting—that is to say, in about fifteen months. No stems should be allowed to grow during the cutting season, which should last from six to ten weeks. If continued too long, the plants will be weakened. After the stems have turned brown in the autumn, they are cut close to the bed and removed. Then the beds are carefully forked over and given a good dressing of well-rotted manure, several inches in thickness. In the early spring the beds are again forked over, tidied, and a dressing of salt applied.

ARE BIRDS THE FARMERS' ENEMIES?

Considering the innumerable insect pests which cause so much damage not only to orchardists, but also to farmers, market gardeners, and horticulturists, too much light cannot be thrown upon the services rendered to these by birds. The excellent collection of insectivorous birds exhibited by the Government entomologist, Mr. Hy. Tryon, at the National Association's show in 1905, went far to demonstrate how numerous are the species of beneficent insectivorous birds which frequent forest, scrub, plain, and orchard in this State. Whilst we hold that a vigorous campaign should be initiated against birds whose existence is inimical to the interests of all engaged in rural pursuits, we still maintain that the ruthless extermination of the much-abused sparrow is to be deprecated. Allowing that the food of a sparrow in the agricultural districts amounts to about 50 per cent. of its total food requirements, there is a season, and rather a long one, when the sparrows destroy an incalculable number of pernicious insects. During the breeding season, there is an enormous number of nestlings, whose food consists almost entirely of insects. Within the last three or four months we have had the flocks of sparrows which frequent our fowlyard and vegetable and flower garden under close observation. During this time the young sparrows have been hatched out, and whilst the old birds descend amongst the fowls and pick up their breakfast of wheat, yet when their own hunger has been satisfied, we have observed them take to the garden in a body. There they diligently picked all kinds of insects from vegetables, grapes, and flowers, flying backwards and forwards with a supply for their young. The result has been that we have a copious supply of grapes and other fruit, and cucumbers, marrows, beans, &c.,

have thriven to a marvellous degree. From an article in the "Mark Lane Express," of 6th November, 1905, we take the following notes on this subject:—

Five-sevenths of the whole diet of the sparrow is made up of insects, so that this bold little "companion of man" does a certain amount of good. In fact, it has been estimated that a couple of sparrows will consume in food for their young about 3,000 insects weekly, each parent bringing a beakful thirty times an hour to satisfy the very good appetites of their young. In connection, however, with the sparrow's love for corn, we must bear in mind that the smaller area under cereals at the present time makes the armies of birds that descend upon it greater than ever, which causes a great deal more destruction than formerly, so that the number of sparrows should be proportionately reduced, but not exterminated, for the reason given above, sparrows may be included amongst useful birds, as the historical fact related of them proves. Frederick the Great, King of Prussia, being very fond of cherries, one day ordered a crusade against the sparrow tribe, some of them having ventured to pick at his favourite fruit. A price of 6 pfennings a brace was set on them; consequently, throughout Prussia the sparrow war was briskly carried on, and so successfully that at the end of two years not only were cherries wanting but most other fruits. The trees were covered with caterpillars and completely stripped of leaves, and insects had increased to a most alarming extent, for not only were the useful sparrows exterminated, but other birds had been frightened away by the extraordinary measures taken against the sparrows. The King was obliged to confess to himself that he had not the power to alter that which had been ordained in the balance of nature by a greater King than he, and so Frederick had to retract his decree, and at considerable expense import sparrows from afar, for these, being birds of obstinately sedentary habits, would never have returned of their own accord.

Now, as regards the field lark, it should be most strictly protected, on account of its use to agriculture, for its food consists of slugs, worms, spiders, small beetles, wireworms, small moths, and other insects taken both on the wing and on the ground. As regards starlings, it is generally acknowledged that they should be looked upon as among the best friends of agriculturists, but rooks are both harmful and useful, so that they should be kept within narrow limits. Thus we see the utmost care must be exercised as to the extent of the destruction of birds, as a little observation as to their organisation and mode of life in England will at once show that the orders of birds whose daily and principal food is drawn chiefly, if not entirely, from the animal world are those that exist both in the greatest number and the greatest variety, and anyone who makes any pretension to know anything of entomology in relation to farming must admit that it is by no means an unimportant work which has been allocated to our feathered friends in agriculture.

MORE ABOUT PEANUTS.

The time for planting peanuts in this State is the end of August and up to the end of November. Thus, between now and that time, those who so frequently write us on the subject will have had leisure to digest the following notes. We have frequently given information in the Journal concerning the value of pea or ground nuts as a farm crop; but, for the benefit of our numerous new subscribers, we once more revert to the subject. The plant is very productive, and yields a very quick return, being from six to eight months in the ground, and is one of the hardiest and most valuable of the productions of husbandry. It thrives in a light sandy soil, and is usually grown in ordinary, dry, arable lands; indeed, it will thrive tolerably well in such indifferent soils as are unfit for the growth of almost any other production. The colour of the pods always partakes of the colour of the soil they are produced in, and this is

a most important point to remember, because the brightest pods always bring the most money; therefore a light-grey soil is always to be preferred. When the nuts are raised from such soil, they are perfectly clean and bright-coloured, no particle of soil adhering to them. This is not the case with black or red or chocolate coloured soils. These leave a stain on the pods, which cannot be got rid of even by washing, and these stained pods never fetch so high a price in the market, although the contained kernel may be as good as those in the light-coloured pods. Our sandy scrub soils are, therefore, especially well suited for the cultivation of the most marketable peanuts. Many of our sandy, loamy, forest lands will produce very heavy crops, if the land is previously well prepared and reduced to a fine tilth. Peanuts may follow any hoed crop with advantage, except sweet potatoes. Corn land is to be preferred. Another point is that they do best on calcareous soil. If lime is not actually naturally present in the soil it must be supplied with no sparing hand.

As to the preparation of the soil and after cultivation, the land should be prepared as for potatoes, except that shallower ploughing is needed—say from 4 to 5 inches. The object of this shallow ploughing is to secure a firm bed on which the nuts may rest. If the ploughing is too deep, the result is that the roots run down to too great a depth, the nuts take longer to ripen, are harder to harvest, and, unless the soil is very porous or thoroughly well drained, they run the danger of destruction owing to an excess of moisture. When the soil has been reduced to a good tilth, the land should be marked off in rows 4 feet apart and crossrows be drawn 2 feet apart. The nuts before planting must be divested of their shells. Two or three seeds are then dropped at the intersections of the rows and covered with from 1 inch to 1½ inches of soil—not more. In from ten days to a fortnight the young plants will be up. Every miss should be replanted at the earliest possible moment. The ground must then be kept thoroughly clean until the vines begin to cover the intervening spaces. Next comes the time for laying by, the vines having extended nearly halfway across the rows. This is done by running a mould board once in the middle, between the rows, and drawing the earth up to the rows with the hoe, care being taken not to cover the vines and to disturb their position as little as possible, as the nuts will now be forming. It will be necessary also to guard against making the bed too high. Soon after this the vines will cover the whole ground and choke every other growth.

The yellow pea-shaped flowers are produced in bunches of from five to seven. After flowering, the flower stalk gradually bends down and forces its point with the incipient seed pod into the earth, where it gradually swells and ripens with about two nuts to each pod. When the vines have quite died off, either naturally or after a frost, harvesting should begin. This work must be done in dry weather. The vines are mown off or cut off with a sickle. These may be used as fodder. The stems are drawn out by hand, the earth shaken off the nuts, and the bunches laid down near the row. Next day they are laid out under cover on a straw platform, and in a fortnight afterwards the nuts are stripped off. This method, however, is only adopted in countries where labour is cheap. In Queensland the simplest and cheapest method of harvesting is to run the plough under the roots, turning the nuts uppermost. They are then dealt with as described. At the fortnight's end, the nuts are either separated from the haulms by hand or, if the crop is large, by means of a machine called Crocker's separator, which separates the nuts into three grades, the heaviest and, consequently, the most unripe nuts being delivered into one compartment, and the ripest and lightest into another. This machine will grade from 15,000 to 20,000 nuts in a day.

The next business is to thoroughly dry the nuts, for if not well dried they will turn dark, musty, and lose 50 per cent. of their value.

A bushel of nuts weighs 22 lb., and the minimum price is 2d. per lb., or £18 per ton for good, ripe, dry, bright-coloured nuts. The yield per acre ranges from 40 to 120 bushels per acre; 2 bushels in the pod will plant 1 acre.

The uses of the peanut are numerous, but its chief value as a commercial product is the oil it contains. The yield of oil is set down at from 16 to 50 per cent. It is largely used as an adulterant of olive, sesame, and cocoanut oils, whilst it possesses the enormous advantage over olive oil in being the product of an annual plant instead of requiring many years for the plant which produces it to mature.

In the East Indies some 150,000 acres are devoted to peanut culture, whilst in the United States about 3,000,000 bushels annually are produced. There is a large and ever-increasing demand for oil seeds all over the world, and also in Australia, where there would be no difficulty in disposing of the crop. In Barbados the average yield is 2,000 lb. of nuts per acre, and yields of 4,000 lb. are not uncommon.

AGRICULTURAL COLLEGES.

Under the heading of "Recent Problems in Agriculture," with the sub-heading of "What a University Farm is for," Liberty Hyde Bailey, Professor of Agriculture in Cornell University, California, U.S.A., delivered a lecture in August, 1905, on these subjects, which are of much interest to us in Queensland, as pointing to higher work, built upon the excellent foundation already laid by Principals Shelton and Mahon, of the Queensland Agricultural College, As yet, we are only in the infancy or, at most, in the secondary stage of agricultural education. Still, we are moving ahead, and when all our industries are booming, and when liberal financial aid can be afforded by the Government, there is no reason why we should not have more than one Agricultural College, say one in the far North, and why we should not be in a position to confer bachelors', masters', and doctors' degrees to deserving students.

From the Smithsonian Institution, Washington, U.S.A., we have received a circular (No. 15) dealing with the "Recent Problems in Agriculture," which is well worthy of earnest consideration by all who are interested in the prosperity of Queensland in respect of her agricultural resources.

Professor Bailey's remarks on this subject in the course of his lecture are short, but to the point. We take from it the following extract:—

"The agricultural college idea is by no means new; it is at least two hundred years old. In this country the agricultural college, as an established fact, originated about fifty years ago. Year after next will be celebrated the fiftieth anniversary of the Agricultural College, near Lansing, Michigan. The first agricultural colleges were established as a protest against the older kind of education that did not put men into touch with real affairs. The Land Grant Act of 1862 marks one of the greatest epochs in the history of education; it is the Magna Charta of education. Its purpose was to give instruction in those subjects and affairs which have to do with real life. And what are they? They are largely agriculture and the mechanical arts. As these agricultural colleges were largely a protest against the older education, it was perfectly natural that at first they should be separate institutions.

"About one-half of the agricultural colleges of the Union are separate from the universities proper. They are doing good work, and I am saying nothing whatever derogatory to them. There are some reasons still given for having separate agricultural colleges. It is said that other courses will attract the young men from the farm. Now, if the agricultural college can't hold the young men it ought to lose them; the time is past when we shall put blinders on the young men. Again, it is said that the farm boy will be looked down on, but students will not look down upon him if his work is of equally high grade as that pursued in other courses. Sometimes the agricultural college is wanted in a separate locality to satisfy local pride. A locality wants to have an agricultural college, and offers inducements to get it. This does not consider the

merits of the case. In some cases, a broom factory might be just as satisfying to the community. The University idea is coming to be a unifying idea in the community, and all university work should be kept together. The time is past when the agricultural college should be torn out of the university and be set off by itself.

"The agricultural college is founded on the conception that education must relate itself to life. Important corollaries follow. In the first place, agricultural education should not necessarily be bound by academic methods. The teaching work in a college really divides itself into two parts—(*a*) the true college work, leading to a Bachelor's degree; (*b*) postgraduate work, leading to two degrees, the first of these being the Master's degree, which should be given for experimental and investigational work, the work involved in the collection and accumulation of facts, &c., and the Doctor's degree, which should be given for a philosophical consideration of the facts and the collections of data.

"Two great enterprises have now come into the college—the experiment station and university extension. They are not university work in the old academic sense. The extension enterprises form the best illustrations of the leadership the university has now acquired in public affairs. The university is required to do university extension work, and it goes beyond the old academic ideals.

"Agricultural education also rests upon a large and quickened idea of the laboratory method. We are introducing laboratory methods into every school in the country; the kindergarten, manual training, the school garden, and science work—all mean the laboratory method. And now we also introduce the affairs of every-day life into the schools. All laboratories are pedagogically valuable in proportion as they are in vital connection with theoretical instruction. No school, whether in California or elsewhere, from the primary school to the university is a good school unless it has laboratory work. The effort is now being made to introduce into every high school in New York a year's work in biology for the first year.

"All this brings up the whole question of the university farm. The college or university farm developed with the Land Grant Act. In its history it has gone through several phases. It was first conceived of largely as a model farm, and of course the model farms became the laughing stock of the farmers of the State; and they will always be. If they are model farms they have little pedagogical use. One farm cannot be a pattern farm for all conditions. There are thousands of model farms. Model farms are good farmers' farms. The State cannot afford to go into the model farm business in connection with university work.

"In the second place, the farms came to be used merely to illustrate farm practices. In the old days we had museums in our colleges, and persons could go and exclaim as they saw the wonders. We still need museums, but we also have collections with which to work. It is not enough that students merely see things growing or see different breeds of animals. They must come nearer than merely to look; they must use and handle.

"Again, college farms were sometimes run with the idea of making a profit; but you cannot run a farm with profit with student labour. If the State is to make money out of a farm, then it must not be used for teaching purposes, but must be conceived of as an out-and-out business enterprise.

"In the next place, there was an idea that these farms ought to represent the Commonwealth—that a farm should be 'typical' of the State. It is a mighty poor State that can be typified in one farm. If the State wants a typical farm let it have it, but do not burden the University with it. Put it in charge of a chamber of commerce or other advertising organisation. Anybody can farm typical land.

"Then there was a long period of years when the college farm was used very little or even not at all. Not knowing just what to do with them, many of them have been allowed to drift.

"Then there came the passage of the Hatch Act in 1887, which established the experiment stations; and this afforded a means of utilising the college farm. There are a good many of our institutions which are now carrying farm lands as experiment stations. Of course we should have farms for research. There are two kinds of research work on farms. One kind of research is in farm practice; the other is research in the fundamental physical, chemical, and physiological problems, which must be done on some farm directly under control.

"Now we have come to the final and proper stage—the farm must then be a laboratory. Thus primarily it must be a laboratory enterprise, and the pattern and model idea are only incidental and secondary. If your people do not believe in this idea, then you must educate your people. A college farm is not primarily for the purpose of growing model or perfect crops. I should rather have the opportunity to teach one student by means of a farm than to show 100 persons a field of perfect pumpkins.

If we study ploughing in the classroom, we must also study it in the field, even if we destroy a crop. We must determine and test the relation of ploughing to moisture, aeration, microbic life, and many other questions. It is more important that a man learn how and why to plough than it is for the college farm to grow a crop of wheat. Even if I tore up the drainage on a farm in order to teach it, I want to be able to do it. The botanist pulls up the plant to study it. In learning how to grow potatoes one should pull them up and study the root system. Not long ago I was asked how deep potatoes should be planted in a certain soil. I asked, 'How many of you know whether the tubers form above or below the feeding roots?' Four or five guessed, but no one knew. But on that fact depends much of the success in planting potatoes. If your students want to see a model orchard, they have a thousand of them in California. We want such an establishment as will allow us to drive our cattle right into the classroom. We are this day building a classroom at Cornell which will hold stock, and which has seats for the students on the sides. They will study real live cattle, not pictures and models. The young men study those cows, and find out why they are good and bad cows. They examine their conformation, &c. These cows are just as much laboratory material as the plants of the botanist or the chemicals of the chemist. Next week, if we should be studying the question of beef cattle, they are brought into the building and the students study them just the same way your students study the stratification of rocks. Ten acres of land to use when I want it, and as I want it, is worth more pedagogically than a thousand acres to look at.

"The value of a university farm from a university man's point of view consists in its usefulness as a means of teaching. If you do not want to call it a farm, call it land. The better it is as a farm, the better it ought also to be as a laboratory; but the laboratory utilisation of it should always come first. If you are not using farms as a means of training men you are not using them for university purposes. A director of an agricultural college said some years ago when a visitor complained that he didn't consider the college farm to be a model farm, 'I would rather have a good man with a flower pot in a window than have a poor man with a thousand acres of land.' A university farm justified from the university or pedagogical point of view must be made a true laboratory to collate and articulate with the theoretical instruction, otherwise the future will not justify your possession of it."

A DISEASE-RESISTING POTATO.

When the new varieties of potato, such as Northern Star, Sir John Llewellyn, Up-to-Date, Evergood, and others were placed on the market two or three years ago as absolutely disease-proof, and as being enormously prolific, at exceedingly high prices, high hopes were entertained that disease in potatoes would be, for a series of years at least, a memory of the past. But, alas! for

delusive hopes, disease has, we are told, been much in evidence, especially in Northern Stars. Now, under the heading " A Disease-Resisting Potato at Last," the " Mark Lane Express" writes:—

At a recent meeting of the Royal Horticultural Society, Mr. T. A. Scarlett, the well-known specialist of Edinburgh, exhibited tubers of what is said to be a disease-proof potato. This potato, by the way, is not a new variety, but a very old one—a black Scotch kidney, called Trochie Grant—and was supposed to be lost to cultivation, but it has been discovered and brought to light. It is said, in connection with this potato, that there is documentary evidence to show that, though grown since 1745, it has never shown the least sign of disease. Probably we shall hear more about Trochie Grant later on, as regards its cropping powers and edible qualities. The colour, of course, is not quite what is wanted in these days, but it is something to hear of a variety that has never been known to take the disease, and, with this potato to work on, hope is given that a disease-resisting variety of modern type may yet be raised. What a boon it would be to farmers and others who suffer more or less every year with the disease in this important crop.

QUEENSLAND LAMBS FOR EXPORT.

In connection with the shipment of fat lambs which were exhibited at the exhibition of the National Association, in Brisbane, in August last, we have received from the association's secretary, Mr. C. A. Arvier, a copy of a letter from London, showing that the judging of the Queensland lambs in England coincided with the awards made at the National Show in Brisbane by the judge, Mr. Harry Baynes.

The breeders of the first and second prize-winners were Mr. G. Alexander and Mr. G. Mutch, of Danderoo.

From this letter it appears that a member of a firm of leading salesmen at Smithfield and a well-known practical butcher gave the award in favour of the Shropshire breed. The judges' verdict was:—

Five lambs marked Shropshire merino: This parcel was of very fine quality, the carcasses were extremely well developed, the meat showing all the best characteristics of the Shropshire breed, while the proportions of fat and meat in the case of the best joints was nicely distributed.

Five lambs marked Lincoln merino: This parcel was a good quality, the carcasses being well developed, but they carried too much fat in proportion to the lean (characteristic of the Lincoln breed) but (*sic*) to suit butchers' requirements.

Summary: Both lots were undoubtedly very fine lambs, but, as regards suitability for the London market, the preference must be given to the Shropshire breed on the one point—namely, the greater amount of flesh they carry on that portion of the carcass where most needed in a very compact form without a superabundance of fat. Accordingly the award of the judges has been given in favour of the Shropshire breed as being the most suitable for the London market. With regard to future shipments, the kidney fat should in every case be out of the carcass.

The judges' certificate is as follows:—

"Waimate," London, 30th November, 1905.

"Five lambs marked Lincoln merino.

"Five lambs marked Shropshire merino.

"We hereby certify that, after having thoroughly examined the above parcels, we unhesitatingly give the preference in favour of the Shropshire breed as being the most suitable lamb for the London market.

"(Signed) G. P. PHIPPS (New Zealand L. and M.A. Co., Ltd.)
"(Signed) BLOFELD AND LESSENDEN (79 Central Meat Market.)
"(Signed) E. A. HARRIS."

The "Journal of Agriculture" of South Australia, for 1st January, 1906, has the following statement by Mr. R. Smith, of Mount Gambier, on lambs for export:—

"One of the most profitable industries at the present time is the raising of fat lambs, and, in conjunction with the farm, there is nothing that will bring in a surer income than the ewe and her lamb for the same amount of labour required. I will confine my remarks to the breeding of lambs on the farm, where the land is at all suitable for the purpose. At the present price of lambs it pays a farmer far better to buy his breeding ewes than to attempt to breed them. The ewes I breed for myself are half-bred Shropshire and merino ewes. They grow a nice class of wool, are easily kept, and make splendid mothers, and, when put to the Shropshire ram again, they produce a lamb hard to beat for a freezer; but, as these ewes are not procurable in any number at present, I would recommend the three-quarter-bred Lincoln ewe, or the first cross Lincoln and merino ewe and the large-framed merino ewe. For the sire, the Shropshire has all the qualities to get lambs suitable for freezing. The purer the ram the better the result, as it is most important that the ram should have those qualities that you desire your lambs to have. The next and one of the most important points is the feed and management, and not to overstock—the mistake that very often occurs. Before buying your ewes, you want to know how many acres you will have to run them on, and how many sheep it will carry to the acre through the winter, because that is the most critical time, when feed is at a standstill. I think feeding the ewes on a little hay or chaff during the winter gives them a wonderful help to rear their lambs. I have fed my ewes on chaff for the last six or seven years, and I am certain it has always paid me well. Had it not been for the chaff this season my lambs would not have been anything like what they were. Besides, I had no rejected lambs. A change of feed and pasture is another important thing; also the growing of fodder crops for winter feed, so that your lambs are not checked for the want of feed, because lambs once given a check will never recover, nor look the same as they would had they received proper treatment. People say, 'How long will the lamb industry last?' Well, to those I might mention that in fat lambs alone last season 750,000 were exported from the Commonwealth, mostly from Victoria and South Australia, an increase of just half a million on the previous season, and at an average price of just on 12s. per head to the grower." In answer to questions, Mr. Smith said he did not note how often he fed them with chaff. He kept the feed bins full, and the sheep came and had a little chaff, and then went away and had some grass. Of course, it would not pay to feed the ewes on chaff alone in the winter, nor would it pay to keep the lambs on it entirely. He used the best hay chaff (wheat and oats). They preferred chaff to anything else. He described the feed boxes he used, which were made so as to prevent the rain wetting the chaff, and allowed the material to descend to the trough as the sheep ate it. There was thus no waste. The boxes were light, and could be shifted to clean spots when necessary. They were better and cleaner than feeding-bags. Some discussion on the feeding of ewes took place, and a number of instances were quoted of the sheep being carried through the critical part of the season by means of a little chaff.

COTTAGE GARDENING.

Some years ago the National Association, with the view of encouraging owners of small suburban plots to beautify their homes by creating flower gardens, offered a gold and a bronze medal, together with a certificate, as prizes for first and second best cottage garden. A condition was that competitors were to have done all the work with their own hands, no professional gardener or any labourer was to be employed. In 1881 there were, if we remember rightly, some fourteen competitors. No specified time was named

for the judges' visits of inspection. The writer entered his garden for competition. The soil of this garden was a hungry, gravelly shale, and at that time there was no water laid on to the property. In due time the judges came along—there were six of them—and the second prize, a handsome bronze medal and the certificate of the National Association, was awarded to the writer. It is undoubtedly owing to this action of the Association that the suburbs of Milton, Toowong, Taringa, New Farm, and other suburbs of the city are to-day beautified by gardens where formerly the spare ground was devoted to the reception of kerosene tins, broken crockery, and other kinds of rubbish. Why should not the Association again give a stimulus to the creation of flower and vegetable gardens? It is surprising what a quantity of vegetables can be raised on a very small plot by careful cultivation and the use of manure and water. The writer works a vegetable garden—soil, as before, gravel and shale, with a stiff subsoil of red clay—which measures exactly 142 square yards, or about 4¼ perches, including footpaths. On this patch there have been, and are still being, produced vegetables sufficient and more than sufficient for the household all the year round. They comprise French beans, broad beans, cauliflowers, cabbage, kohl-rabi, lettuce, beetroot, eschalots, carrots, parsnips, endive, Jerusalem and globe artichokes, Lima beans, cucumbers, West Indian gherkins, custard and long marrows, celery, parsley, sage, and other herbs, peas, tomatoes, rhubarb, cress, chillies, peanuts, coffee, radishes, egg fruit, and a few potatoes. Besides these, there is a small bed of strawberries (Aurie) which bore this year from July to the end of January, and regularly furnished a good plateful every morning. There are also six peach and two apricot trees, and half a dozen good grape vines. All these do not come on at once, of course, but in succession, and this shaley ground has now been worked for seven years, constantly producing vegetables and fruit. As to the labour required, as may be imagined, that is very light. Two hours in the early morning, from 5 to 7 or to 7·30 a.m., an hour or so after 5 p.m., Saturday afternoons, and holidays suffice to keep the garden in highly productive condition.

There are hundreds of plots of vacant land attached to cottage residences, with infinitely better soil, which would provide pleasant and remunerative employment for one or two members of a family, and form an incentive to home life, to take the place of aimlessly wandering up and down Queen street after business hours. This is the sort of thing which should appeal to the Council of the National Association for encouragement.

STACK SILAGE.

The season having been so favourable to the growth of all crops suitable for the silo, it behoves all dairy farmers to seize the splendid opportunity afforded them to make provision for a possible scarcity of fodder in the coming winter. This can be done during the next two months, and as several farmers have told us that they cannot afford the outlay necessary on a silo building, we would suggest the stack, in preference to losing the superabundant forage. All sorts of forage plants, both cultivated and wild, may be turned into good silage in the stack. But we will suppose a large crop of oats is to be dealt with. Oats cannot be cut too green for the ensilage stack, provided the crop has reached the earing stage, and should be carted to the stack immediately on being cut, regardless of wet weather conditions.

To start the stack, lay a foundation of logs on the outside of the space to be occupied by the fodder, and fill in between with broken stones and gravel. Then place a layer of straw over the gravel. This will raise the foundation about 1 foot from the surface of the ground, and allow all surplus moisture to run away. Now place a layer of oats, 10 feet deep, on the straw.

Stop operations for a day to allow the forage to settle down. Continue in this way until the stack has reached the desired height. Lay all the butt ends outwards, and make the stack as square and solid and plumb on the outside as possible, by which means the greatest pressure is produced and the air is more effectually kept out. When the stack is finished, put a load of straw on the top, with a couple of wires weighted with stones to keep the straw from blowing off. No artificial pressure of any kind is needed. In a very rainy season some cover in addition to the straw would be advisable. The smallest-sized stack which is allowable is one 10 feet by 10 feet, holding 20 tons. The smaller the stack, the greater the waste at the sides. A stack 14 feet by 14 feet will contain 100 tons. One ton of green oats will make 1 ton of ensilage, of which 1 cubic foot will weigh 45 lb.

Maize is a splendid crop for ensiling. It should be sown broadcast, and will yield from 8 to 12 tons per acre. The time to cut is when it is in tassel. Place it in the stacks as in the case of oats. The result will be that only about 1 foot of waste will be found on the outside.

Allow 6 tons of ensilage per cow per half-year. This allows for waste, but from 30 lb. to 35 lb. per day is sufficient for a cow.

The question is often asked if Queensland bush grasses are suitable for ensilage. Mr. John Mahon, Principal of the Queensland Agricultural College, does not recommend them unless chaffed and mixed with a preponderating proportion of lucerne, maize, sorghum, amber cane, or cowpea. Experiments made at the College with bush grasses showed that they did not contain substances suitable for their conversion into silage. The best way of saving bush grass is to convert it into hay. In America, after the maize is harvested, the dry stover is turned into excellent ensilage by turning a stream of water on to it as it is placed in the silo. Farmers here would not believe that the stover could possibly make silage, but in 1903 some very good stover silage was shown at the National Association's show, which was made at the Westbrook and Hermitage State Farms.

A silo may be cheaply made by digging a pit and filling it with chaffed or whole maize, oats, tares, lucerne, barley, thistles, and such like succulent products. The conditions to be observed are: Thorough drainage at the bottom, solid sides, protected if need be by boarding or slabs, tight packing by trampling, especially in the corners, good thick covering of straw or material impervious to wet.

NOTES ON THE SISAL INDUSTRY.

An American company is cultivating 1,100 acres of sisal on the Caicos Islands, where (says the United States Consul Moffat at Turk's Island) thousands of acres are available at long leases, at a nominal rent of 5d. per acre. The fibre grown on the islands is said to be equal in quality to the best grades of Yucatan. The entire output is marketed in the United States.

In Cuba (we learn from the "Hawaiian Forester") the sisal industry is being developed on a large scale. There is a ropewalk and naval supplies factory at Regla, near Havana, which, in 1904, used 2,000,000 lb. of Cuban-grown sisal hemp, besides importing 3,500,000 lb. from Yucatan and 2,000,000 lb. of Manila hemp. This factory produces about 95 per cent. of the twine and rope used in Cuba, and has a daily capacity of 35,000 lb. Plans are being made to extend the area planted in sisal, especially along the north coast of the island. The sisal leaves produce 10 per cent. more fibre in Cuba than in Yucatan, and the fibre is equal to the Yucatan product in quality. [The same may be said of Queensland sisal fibre. Queensland agave leaves weigh 4 lb. as against an average of 1 lb. 10 oz. in Yucatan, and each leaf will yield $1\frac{1}{2}$ oz. clean fibre as against 1 oz. in Yucatan.—Ed.]

The Orchard.

SPRAYING FOR SCALE INSECTS.

Amongst the many valuable and interesting bulletins published by the University of California is one (No. 166) on Spraying for Scale Insects, by H. J. Quayle. It deals with experiments in spraying against the brown apricot and San José scales. The former of these, despite its name, does the most damage to prune-trees, on which it thrives better than on apricot-trees.

Heretofore the remedies applied for the brown apricot scale seemed to have been inadequate to keep it under proper control, and it was the purpose of these experiments to determine upon an effective remedy for this insect, as well as to decide upon a satisfactory formula for the lime-sulphur-salt wash, which is the standard remedy for the San José scale. The work was done in Kings County, in the Upper San Joaquin Valley, in the immediate vicinity of Hanford, and included the spraying of about 1,000 acres of trees, of which the greater number were prune, and the balance consisted chiefly of peach and apricot.

The Lime-Sulphur-Salt Wash.

History in California.—The lime-sulphur-salt wash is of California origin, and in the East it is sometimes known as the California wash. The above ingredients with water originally constituted a sheep dip, and when horticultural interests began to be menaced by the ravages of the San José scale it was one of the first mixtures that proved effective as a remedy. The value of this solution as a spray was first demonstrated in 1886, by Mr. F. Dusey, a resident of Fresno, who experimented with a sheep dip prepared by Mr. A. T. Covell. The mixture, with some modification, quickly came into favour, and is now considered the standard remedy for the San José scale, not only in California, but in most of the Eastern States.

The following tabulation shows the evolution of the wash in California:—

	Lime. Lb.	Sulphur. Lb.	Salt. Lb.	Sugar. Lb.	Water Gal.
1886, Original formula (sheep dip) ...	80	100	10	20	160
1887, I. H. Thomas	25	20	15	...	60
1887, A. T. Covell	50	20	15	...	60
1890, I. H. Thomas	30	25	15	...	60
1891, Lelong's report	40	20	15	...	60
Hort. Com. Sutter County ...	40	20	15	...	60
1904, Recommended in this bulletin ...	30	15	10	...	60

When the wash was tested in the Eastern States, in 1895, the results were so unsatisfactory that its use was abandoned until again tried in 1900. The results on this occasion were so satisfactory that from this date the lime-sulphur wash rapidly came into use in the East. The first failure resulted from the application of the wash being followed by drenching rains.

Difference in Amount of Lime.—Various amounts of lime were used, ranging from 20 to 50 lb., as given in the formulas below:—

Lime. Lb.	Sulphur. Lb.	Salt. Lb.	Water. Gal.	Effect.
50	20	15	60	All killed.
45	20	15	60	All killed.
40	20	15	60	All killed.
35	20	15	60	All killed.
30	20	15	60	All killed.
20	20	15	60	All killed.

The amount of lime necessary to combine with the sulphur has been found by practical tests to be about equal parts by weight, and for this reason equal amounts only are recommended by some stations, some going so far as to say that an excess of lime amounts to mere whitewash. The combination effected between the lime and sulphur is not a simple one, however, and it may be that the different compounds produced, when different proportions of lime are present, may make an essential difference in the effectiveness of the wash. These experiments were not full enough to give any very definite data upon this point, but that there is some effect, apparently due to the mere presence of uncombined lime, is shown by the difference noted during the application of a single tankful, due to its settling from lack of proper agitation. It was found that the live scales, if any, were more abundant where there had been a scarcity of lime. Particularly is this true where heavy rains will readily wash away the clear liquid and reduce the period of effectiveness. A comparative experiment showing the effect of the clear liquid, and one in which there was a considerable excess of lime, follows. The clear liquid was that which remained at the top after the wash was allowed to settle for twenty-four hours.

	Number Scales Counted.	Number Dead.	Number Alive.	Dead, per cent.	Alive, per cent.
Clear liquid ...	512	482	30	94·1	5·9
Excess of lime...	340	340	0	100·0	0·0

It is a common opinion now that the less easily soluble compounds remain effective for some time, and these are better retained in the coating formed by the lime. On the other hand, too much lime is unnecessary, especially when it is applied by a hand-pump with no apparatus to keep the lime in suspension, since the lime quickly settles to the bottom, where it is taken up by the pump and applied on the first few trees.

Variation in Amount of Sulphur.—We may consider sulphur as the important ingredient of the wash, since it is the compounds formed by the union with the lime that gives it its principal insecticidal value. All the sulphur will enter into combination so long as there is, approximately, an equal amount of lime to combine with it. The sulphur, therefore, may be called the basic ingredient of the wash, and the proportion of this substance present determines the strength of the wash, providing there is the necessary amount of lime present.

Different amounts of sulphur were tried, the quantities varying from 40 to 50 lb. to each 60 gallons of water. A material reduction in the amount of sulphur changed the character of the wash both as to colour and specific gravity. The effect of the solutions containing a small amount of sulphur on the scales was a falling off in efficiency:—

Lime. Lb.	Sulphur. Lb.	Salt. Lb.	Water. Gal.	Effect on Scales.
40	40	15	60	Good.
40	35	15	60	Good.
40	30	15	60	Good.
40	20	15	60	Good.
40	10	15	60	Not satisfactory.
40	5	15	60	Not satisfactory.

The Effect the Wash has on the Scales.—The wash evidently kills the scales by contact, and this is supposed to be due to its caustic effect. The easily soluble compounds act upon the scales immediately, while the less soluble compounds remain effective for some little time. In addition to this, the mechanical effect due to the coating of the lime may possibly prevent the escape of the young.

Effect on the Tree.—The wash has no appreciable injurious effect on the tree—that is, unless applied late in the season when the trees are in full bloom.

Even then, certain trees do not appear to suffer, as shown in the case of a number of peach-trees that were sprayed at this period with apparently no ill effect. A number of prune-trees were also sprayed while in full bloom, and while the petals were considerably browned, the fruit suffered no serious injury. Spraying at this season, however, is not to be recommended, since work against scale insects on deciduous trees can be accomplished while the tree is still dormant.

SUGGESTIONS FOR LIME-SULPHUR-SALT WASH.

The Formula.—The formula determined upon as a result of these experiments which seemed most satisfactory from the point of view of cost and effectiveness is as follows:—

Lime	30 lb.
Sulphur	20 ,,
Salt	10 ,,
Water	60 gallons.

Preparation.—For preparing the wash two vats or boilers are necessary, and if the spraying is to be done on a large scale, one of these at least should hold a couple of hundred gallons. If but a small number of trees are to be treated, ordinary iron kettles will answer the purpose. Of course, the preferable way of cooking the wash is by means of live steam.

Many ways have been suggested for mixing the materials, but the results are the same in every case, so long as the mixture has been subjected to the required amount of boiling. It is largely a matter of convenience, then, that determines the particular method, and the one found in these experiments to best answer this requirement is as follows:—

First place 2 or 3 inches of water in the boiler, and to this add the sulphur, which has previously been made into a paste by mixing with hot water in order to remove the lumps, or sift the dry sulphur through a mosquito wire-netting and stir in thoroughly. Then add about one-fourth of the lime, and when the violent boiling has ceased add another fourth, and so on until the required amount of lime has been added. Hot water should be added with the lime as needed, so as to make the mixture of a creamy consistency. Too much water will "drown" the lime, while on the other hand too little will cause incomplete slaking of the lime. In this way the heat generated by the slaking of the lime is taken advantage of, and by adding the sulphur first plenty of time is given for removing the lumps.

By the time the lime is thoroughly slaked the fire should continue the boiling, so that the time of boiling begins with the addition of the lime. The salt and about one-fourth of the water should now be added, and the whole boiled from one to two hours, keeping it frequently stirred in the meantime. At the end of this period screen into the spray tank, and add the necessary amount of hot water, and apply to the trees hot.

The wash when properly made is a heavy reddish-brown liquid, very caustic and having a strong sulphur odour. The heavier materials settle upon standing, leaving a lighter liquid both in colour and weight.

Application.—On account of the heavier ingredients of the wash quickly settling to the bottom, means should be provided for agitating the mixture in the spray tank. This is best done, of course, by the power outfit. In the absence of this, a gearing may be attached to the wheel of the wagon, and the mixture agitated while going from one tree to another. A still simpler way is to stir frequently by means of a hoe or paddle.

The nozzle should be of the stopcock type, which will permit of ready cleaning. The type of spray should be a rather coarse one, which will thoroughly wet the insects, and not a fine mist as used in paris green work. Thoroughness of application cannot be too strongly urged, and no part of the tree should escape treatment.

Viticulture.

MANUFACTURE OF DRY WINES IN HOT COUNTRIES.

Amongst the many valuable and interesting publications which we receive from the University of California is one which we regret we are, owing to the exigencies of space, unable to print *in extenso*. Still, even the introduction to the pamphlet on this important subject, which is written by Frederic T. Bioletti, as the outcome of a recent visit made by him, under the auspices of the University, to some of the chief vinegrowing regions of Europe and Algeria, will be of value to our vignerons, whom we advise to obtain the Bulletin No. 167, April, 1905, dealing with the problem in question.

Mr. Bioletti, in introducing the work, says:—

"It is a remarkable but well-recognised fact that in the regions where the vine flourishes best—that is, where it yields the maximum crop for the minimum labour—the greatest difficulties are encountered in the manufacture of sound dry wines. In a general way it may be said that nearly all the fine dry wines of the world are produced in regions such as those of the Gironde, Burgundy, and the Rhine, where the climate is relatively cool, and where the vine does not attain its fullest development either of growth or of crop. In the warmer and more productive regions, if wines of superior quality are made they are usually sweet or of sherry type. The dry wines of these regions are of two general types—(*a*) thin watery wines, such as those of the south of France, whose main value lies in their cheapness; and (*b*) heavy, coarse wines valuable for blending, such as those imported into France in large quantities from Spain, Algeria, and elsewhere. The wines of the latter type are not only defective in quality, but very commonly unsound, and large quantities, in the aggregate, spoil before they reach the hands of the wine merchant and become a total loss or are made into inferior brandy. This loss would be much greater but for the use of the antiseptics which are freely employed wherever the practice is not prevented by effective pure-food laws. Before discussing the question as to whether the wines of the warmer regions can be improved, and, if so, what are the most practical methods, a clear understanding of the nature of their defects and the causes of these defects is necessary.

"The quality of a wine depends on two groups of factors:—(*a*) Those which have to do with the nature of the raw material—that is, the character of the grapes; and (*b*) those which have to do with the way in which this raw material is treated—that is, the character of the methods of manufacture. Each of these groups of factors influences the other, so that it is often difficult to decide whether certain qualities of a wine are due to the character of the grapes, or to the way in which they have been handled in the process of manufacture. For example, a wine is deficient in colour; this may be due either to a lack of colouring matter in the grape or to an imperfect method of manufacture which has failed to properly utilise the colouring matter present. Again, if a wine is spoiled by bacterial fermentation, the cause may lie in careless, uncleanly methods of manufacture, or in a lack of due acidity in the grapes, which favoured the growth of bacteria. In this way nearly all the qualities of a wine are influenced, both by the character of the raw material and by the method of manufacture; and a defect in either may often be neutralised to a great extent by a corresponding change in the other.

"The relative importance of these groups of factors is a matter on which the opinion of winemakers has been greatly modified during the last ten or fifteen years.

"Formerly, the first group was considered of overwhelming importance, and certain regions were considered totally unfit for the production of sound

dry wine, on account of the supposed unsuitable nature of the grapes grown there. Yet many of these regions produced the finest, largest, and best-flavoured table and raisin grapes. Now, while the qualities desirable in an eating grape are not the same as those necessary for a winemaking grape, there is no doubt that the main reason for the failure to produce good dry wines in the plains of Algeria or the San Joaquin Valley does not lie in the qualities, either negative or positive, of the grapes, but in the attempt to make wines in a hot climate by methods suited only to a cool one.

"It is worthy of note that in the regions that have been famous for the production of fine wines, such as Médoc, Rheingau, and Burgundy, the finest and highest-priced wines are produced on warm, dry hill slopes, and in years when the summer is exceptionally warm and dry. This is equivalent to saying that the finest wines of these regions are produced in situations where the soil conditions approach most nearly to those of California vineyards, and in seasons when the weather during the growing and ripening period of the grape approaches most nearly to the California climate. In fact, the more nearly the chemical composition of the grapes of the Rhine and the Gironde approaches that of California grapes, the higher the quality of the wine and the higher the price it brings in the market. Yet it is perfectly true that it is only exceptional and apparently accidental when our California wines equal or approach the quality of the best wines of the above regions.

"If the composition of the raw material is approximately the same, the quality of the manufactured material ought not to differ much unless the conditions of manufacture are different. It is doubtless in the failure to make these conditions identical or equivalent that the chief difficulty lies. The use of the same methods does not result in realising the same conditions in a hot climate as in a cool one, and, whatever the summer temperature of the Gironde may be, the temperature of the autumn, when winemaking takes place, is always very much cooler than it is here. Many of the defects of our wines which were supposed to be due to inherent faults of the grapes have been shown to be due to bacterial and defective yeast fermentation, and to be completely under the control of a suitable method of winemaking. This does not mean that the locality where the grapes are grown is without influence, or that it will ever be possible to produce a Château Lafitte or a Schloss Johannisberg in Hérault or Tulare. It does mean, however, that wherever grapes mature a perfectly sound wine of good quality can be made, and that throughout the great central plain of California sound dry wines can be produced in unlimited quantities, superior in quality to the great bulk of European wines.

"The average sugar contents of the grapes of the plains of southern France will probably not exceed 16 per cent., while that of the grapes of the San Joaquin will be approximately 20 per cent. There is a corresponding superiority in other ingredients, such as body and tannin; in everything, in fact, except acidity and perhaps colour. The first of these defects can be remedied legitimately and without any great expense artificially, while the second can be minimised by proper methods of winemaking and by a suitable choice of varieties. Taking these facts into consideration, then, 16 tons of grapes in the San Joaquin Valley are about the equivalent for winemaking purposes of 20 tons in the plains of the Midi. The importance of this is proved by the many attempts being made to increase the alcoholicity of the wines of southern France,* and by the fact that the most effective method at present seems to be a partial concentration of the grapes, by which 20 per cent. or 30 per cent. of the water is evaporated before they are made into wine. This is equivalent to a reduction in volume of 20 tons to 16 or 14 tons. By this means from 20 tons of grapes is made about 2,400 gallons of full-bodied wine, suitable for export or blending, having, say, 12 per cent. of alcohol, instead of 3,200

*What we need to satisfy our markets is alcoholic, heavy-bodied, deeply coloured wines such as are not produced by our modern methods of intensive cultivation.—"La Concentration des Vins," by L. Roos, Bordeaux, 1902.

gallons of thin, weak 'vin ordinaire,' with only 9 per cent. of alcohol. With a corresponding 20 tons of Fresno grapes it should be possible to make, without the expense of concentration, 3,200 gallons of wine equal in quality to the 2,400 made from the same quantity of French grapes. That this has not been done, or done only exceptionally and accidentally, is, I believe, not the fault of the grapes, but of the methods of manufacture. Much of the dry wine which it is attempted to make in the hot interior valleys of California spoils before it ever reaches the consumer, or more usually is distilled or metamorphosed into an inferior sweet wine. The dry wine at present made in this region is to a great extent of very inferior quality, deficient in normal acidity, tannin, colour, aroma, and showing various defects, cloudiness, acetic and butyric acid, mannite, &c., due to bacterial or other improper fermentations. This state of things is so well recognised that most winemakers of the San Joaquin Valley have ceased to attempt to make dry wine and turn all their grapes into the sweet wines for which the region is so specially adapted.

"The crisis to which the sweet-wine market is subject in years of heavy production would be modified if it were possible to turn a certain part of the grape crop into dry wine. Many of the varieties of grapes planted in the great valleys are, moreover, more suited to the production of dry wines than of sweet. If the making of dry wine is to pay, however, the results must be more under the winemaker's control, and the quality must be higher than it has been in the past.

"With regard to the certainty of control, it is my firm belief that there is no region in the world where the winemaker can be so sure of making every year a good, sound, dry wine of uniform quality as in the great central plain of California. An opinion so opposed to the practical results of the past was not arrived at without careful consideration, and is based principally upon the methods and tendencies of modern winemaking in Algeria and southern France, and on the long and careful tests conducted for many years by the Agricultural Experiment Station of the University of California at the Fresno, Tulare, Amador, and San Luis Obispo substations and the viticultural cellar and laboratories at Berkeley. To attain this desired result, however, requires very considerable changes in the present methods of winemaking, and in the course of this report an attempt will be made to show the essential features of this necessary change.

"The conditions upon which the quality of wine depend are:—

"First.—Those which affect the nature of the raw material, viz.:—Variety of grape, climate, soil, methods of cultivation (including pruning, fertilising, &c.), vine diseases, time of gathering.

"Second.—Those which depend on the methods of manufacture. These methods may affect the wine in a great variety of ways. They may modify its composition by means of the addition of various substances which occur naturally in the grape, such as sugar, water, tartaric acid, and tannin, or even of substances which do not occur there in appreciable quantities naturally, such as citric acid and plaster. They may cause a more or less perfect utilisation of the substances in the grape, and in this way control to a great extent the amount of colour and tannin and even of alcohol and acid in the resulting wine.

"It is in the control of the fermentation, however, that the methods of manufacture have the most scope for affecting the quality of the wine for good or ill. The character of the fermentation depends on four main factors:—(*a*) The composition of the grape; (*b*) the kind and number of micro-organisms (yeasts, moulds, and bacteria) present; (*c*) the temperature of the fermenting mass; and (*d*) the amount of aeration.

"In accordance with these facts, the attempts at finding a solution to the problem of the manufacture of sound, dry wine of good quality in hot climates have been made along different lines, which are discussed in the remaining portion of this bulletin."

Botany.

CONTRIBUTION TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, F.L.S., Colonial Botanist.

The following addition to our exotic noxious weeds has made its appearance at the Gatton Agricultural College:—

SOLANUM, Linn.

S. barbisetum, *Nees*, in Trans. Linn. Soc., XVII., 51. Stems and branches clothed with close clusters of fine hairs, and longer straight prickles, as well as stellate ones. Leaves, ovate with short triangular lobes, sometimes sinnate, rather hairy on both surfaces, and prickly. Racemes, lateral, many-flowered, 2 to 6 in. long, secund, prickly. Pedicels, $\frac{1}{2}$ to 1 in. long, deflexed after flowering. Calyx-lobes, 3 to 4 lines long, oblong-lanceolate. Corolla, blue, lobes very narrow, acute. Berry, $\frac{1}{2}$-in. in diameter, globose, glabrous; enclosed by the prickly calyx. Seeds, about $1\frac{1}{4}$ lines in diameter, minutely villous.

Hab.: Sub-tropical regions of an altitude of from 1,000 to 5,000 ft., *C. B. Clarke*, in Hook. Fl. Brit. Ind.

The specimen I have received is only a fruiting inflorescence, immature, without leaves. The above description, therefore, is taken from Hooker's work, l. c., &c., &c. I thought it, however, my duty to call attention to the plant, because, if allowed to spread, it will soon prove as great a pest as its allies—*S. sodomæum* and *S. aculeatissimum*, the variegated and scarlet-fruited, so-called, Devil's or Sodom's Apples.

CABBAGE-CUM-BRUSSELS SPROUTS.

Both above and below the Range, the cabbage is grown over a large stretch of country to perfection. Even in the torrid West, at Emerald and at Barcaldine, the cabbage thrives so well that large quantities are grown and forwarded by rail to the Rockhampton market. Brussels sprouts, on the other hand, are rarely produced east of the Darling Downs, either the climate or the soil or both being unfavourable to the successful production of this delicious member of the Brassica family. We have certainly seen and tasted some very good Brussels sprouts grown on the coast, but they are not regularly grown as a farm crop. A short time ago there was exhibited at a meeting of the Royal Horticultural Society, Wisley, England, by Mr. Ridgewell, of Histon, Cambridge, a novelty in the shape of a crossbred brassica, derived from a cabbage and a Brussels sprout, showing the chief characteristics of both plants. Attached to the exhibit was the following statement:—"The result of a cross between Winningstadt cabbage and Cambridge Champion Brussels sprout. The plants produce fine large cabbage, and at the base of every leaf large buttons are formed, so that after cutting the cabbage a good crop of firm, large buttons may be gathered. As the plants were raised in the autumn, a good many suffered through the hot weather, but if sown in the spring fine heads of cabbage may be cut in the autumn, to be followed by large buttons."

This is all we know at present about the new cross. If it can be kept true, it will probably result in the production of Brussels sprouts on many of our Southern coast lands. Experiments were being made at the society's gardens, at Wisley, and should these prove successful, the market gardener will have made a valuable acquisition of an economical vegetable.

Tropical Industries.

THE FIBRE INDUSTRY IN QUEENSLAND.

There can be little doubt that within very few years the production of sisal hemp in Queensland will have assumed proportions which will entitle it to rank among the staple exportable products of the State. So far, the greatest quantity of fibre has been produced at the penal establishment at St. Helena, and those who have seen the rope, binder twine, halters, clothes lines, and plough lines manufactured by the proprietors of the Kangaroo Point Ropeworks from the fibre produced at St. Helena are unanimous in their praise of the excellence of the product. Many persons have during the last couple of years obtained plants from the Department of Agriculture and Stock, and have planted from 1 to 15 acres. This is, of course, mere experimental work; but, as it has been proved that the aloe will thrive and produce a large percentage of fibre both on the coast and inland all over the State, experimental work, therefore, is no longer needed.

The question then arises: What are the growers of small areas to do with the crop?

To make a fibre venture pay, it is necessary to plant a large area, and that area must be in the immediate neighbourhood of a factory. Why this must be so can be easily shown. The leaves of well-grown sisal plants contain an average of 4 per cent. of fibre by weight. Now, how many tons of leaves will be required to manufacture one ton of dry fibre?

On the basis of 4 per cent. of fibre per ton of leaves, the manufacturer would require to cut, haul, and work about 26 tons of raw material. What price can he afford to pay the grower, so that both he and the latter can make a profit on the transaction? The present price of sisal fibre is about £35 per ton. Each ton of leaves will yield about 85 lb. of fibre, worth £1 6s. 6d. The cost of manufacture and marketing amounts to about 30 per cent. of the value of the fibre, or 7s. 6d., leaving a profit of 19s. on one ton of leaves. Here we have a basis for estimating the price which the factory can afford to pay for the raw material. That price cannot be higher than 15s. per ton. Can the small grower afford to grow, cut, load, and deliver to the mill at that price? A good cutter can cut 1,200 leaves in a day, equal to 4,800 lb., or say 2 tons.

A single acre of sisal plants—say 700—will, in the fourth year after planting, yield 40 leaves per plant. Allowing an average of 3 lb. weight per leaf (and leaves in Queensland usually average 4 lb. each), a plant will furnish 40 leaves in the year, or 120 lb. weight. Thus the yield per acre will amount to, say, 37 tons. We next consider the expense of producing this crop, and of cutting and hauling it to the factory. The sisal plant requires so little cultivation that this item may be put down at £5 from time of planting to maturity, exclusive of the cost of plants and planting, say £1 10s. per acre. A good workman will cut 2 tons of leaves daily, and the whole crop consequently in eighteen days about, at a cost of £4 10s. (wages reckoned at 5s. per day).

Cartage at 5s. per ton, £9. 5s., a total of £20 5s. The cost of the next and succeeding crops would be reduced by cost of planting and four-fifths of the cost of cultivating, amounting to a reduction of £5 10s.

Now, the farmer would expect a profit on the crop of not less than £5 per acre. The question then arises: Can the factory-owner afford to pay such a price for the leaves as would allow of such a profit to the producer? This may be worked out as follows:—

The quantity of dry fibre contained in the leaves ranges between 4 and 5 per cent. of the gross weight of leaves; 4 per cent. on 37 tons amounts almost to $1\frac{1}{2}$ tons (1.48 actually). The value of this in the home and colonial markets is at present £52 10s.

In all sisal-producing countries the cost of the whole work of planting, cultivation, harvesting, scutching, baling, freight, and commission is set down at 40 per cent. of the value of the fibre, or £20 16s., of which the farmer pays about £15 and the machine-owner £5 16s., included in the price he pays for the leaves. A Todd or Prieto machine will clean 150,000 leaves in a day, employing only two men to feed the machine and remove the fibre. Thus more than the produce of 1 acre would be scutched for a very nominal sum in wages and fuel. Now, allowing £6 for the machine-owner's daily expenses, baling, freight, &c., and 10 per cent. per annum, or £100, on the value of the machinery, equal to about 7s. per working day, and putting repairs, stoppages, and other unforeseen delays at 13s. per day, we arrive at £7 as the cost of preparing 1½ tons of fibre, worth £52 10s., the profit so far amounting to £45 10s.

Now comes the question what the machine-owner can afford to pay for the leaf.

The farmer has 37 tons, which have cost him £20 5s. to grow, cultivate, cut, and deliver to the mill. To enable him to clear £5 per acre, his crop should bring him in, roughly, £26.

Deduct this from the machine-owner's return of £45 10s.; a credit balance is left of £19 10s. on the day's work; whereas if he grew the raw material in the immediate neighbourhood of the factory, his profit, reckoning expenses at 40 per cent., would be about £31 15s. Can we now wonder that Mexican sisal-growers are enormously wealthy, or, as the British Consul at Mexico City said, "that some of them are millionaires"? We thus arrive at the conclusion that a sisal crop will yield a good profit at from 15s. to 17s. per ton of leaves, always provided that there is no long haulage by road. Neither sisal nor sugar-cane will pay to haul over 2 miles.

SMALL SCUTCHING-MACHINES.

Several farmers have planted small areas of sisal with the view of ultimately purchasing a small Raspador, and working off their own crops. Amongst these small machines are the Mexican Raspador and the Mauritius Gratte, of which several hundreds are in use in those countries by native growers of sisal. They are also kept on large plantations as a stand-by in case of a breakdown of the large machinery. These small machines, however, do very slow work, as only half of one leaf is cleaned, when it has to be reversed to clean the other half. The leaf is held by the workman, who can generally clean two leaves in one minute. By working continuously for ten hours, 1,200 leaves, yielding about 1 cwt. of fibre, worth £1 15s., can be put through such a machine in a day. There are, however, Raspadors which are credited with 7,000 leaves in ten hours. The cost of the small machines is from £16 to £35, the cheaper being purchaseable in Mexico. A greatly improved machine is that manufactured by Messrs. Barraclough and Co., Bucklersbury, London. These are made in three sizes, varying in prices from £39 15s. to £32 5s. 6d., according to the width of the scutching wheel. The horse power required to drive them is from 1½ to 2 h.p. An automatic feed table can be added to them, which raises the price to £83 10s. These machines are credited with an output of about 600 lb. of clean fibre per day. The Death and Ellwood machine was considered the most perfect of its kind until the more elaborate Todd (T. C. Todd, Patterson, New Jersey, U.S.A.) and Prieto (Mexico) machines were invented.

The Death and Ellwood machine will turn out from 300 to 600 lb. of dry fibre, the latter two machines 1,500 lb. daily. The cost of the former is £130 and of the latter between £600 and £700, exclusive of driving power.

It will obviously not pay a farmer growing from 10 to 30 acres of agave to purchase a machine and engine any more than it would pay the grower of 10 to 30 acres of cotton to set up a cotton-ginning establishment. But by co-operation good results may be achieved. If a group of farmers were to combine

and plant, say, 200 acres in the aggregate, then, although the outlay for machinery and the cost of working would still not be commensurate with the returns, yet a certain profit would undoubtedly result from the planting up of dry, stony portions of the farms on which no other crop could profitably be grown.

One hundred and fifty pounds would suffice to purchase a Barraclough machine and a 4-h.p. engine. An output of 300 lb. of dry fibre per day would at present prices be worth £4 13s. 9d., against which would be the cost of labour, cutting, hauling, and cleaning $3\frac{1}{4}$ tons of leaves as above given. The labour would amount to two men cutting for one day, 10s.; two men, or one man and one boy at the machine, 7s. 6d.; and one man hauling, 15s.; total, £1 12s. 6d.

Thus, 200 acres will, in the fourth year, yield 7,400 tons of leaves, equal, at a return of 4 per cent., to 300 tons of fibre, of a value, at £35 per ton, of £10,500. Deduct 40 per cent. for expenses; there remains a profit of £6,482, or over £32 per acre.

But let us, for argument's sake, set down the yield per acres of leaves at one-half the stated quantity, or at 20 leaves per annum; still the profit would be far larger than that resulting from any ordinary crop. A crop of 20 leaves per plant, each leaf weighing 3 lb., would yield 1,680 lb. of dry fibre per acre, worth £26 5s. Deducting 40 per cent. for expenses, there remains a net profit of £11 per acre.

A still lower estimate may be given which will yet show a reasonable profit. If we allow only 10 leaves per annum per plant, the crop per acre will amount to 7,000 leaves, weighing 21,000 lb. The dry fibre from these at 4 per cent. will amount to 840 lb., worth £13 2s. 6d. Deducting 40 per cent. for expenses, there remains a net profit of £5 5s. per acre.

Having thus put these aspects of the case before our readers, let us see what the actual results were on a plantation in Hawaii, where all the heavy initial expense of forming the plantation, cultivating for four years, purchase of machinery, and heavy salaries were charged to the first crop taken off only a portion of an estate of 595 acres, and yet a profit of nearly £541 was shown.

We are, fortunately, able to place before our readers the certified balance-sheet of the Hawaiian Sisal Company, from its inception on 15th December, 1898, to 1st March, 1903, as published in the "Hawaiian Forester" of September, 1904.

COST OF PLANTING AND CULTIVATING 595 ACRES OF SISAL BETWEEN THE DATES MENTIONED.

	£ s. d.	£ s. d.
Labour account	3,591 10 6	
Less labour paid for cutting, loading, hauling, clearing, milling, and baling $31\frac{1}{4}$ tons fibre by contract at the rate of £8 15s. per ton, charged to this account ...	273 8 9	
		3,318 1 9
Tools	...	89 19 $2\frac{1}{2}$
Surveying	...	1 1 1
Salary	...	1,296 17 6
Repairs	...	10 0 10
Promotion (of company)	...	416 13 4
Sisal plants	...	83 16 $3\frac{1}{2}$
Office expense	...	12 3 $2\frac{1}{2}$
Nursery plants	...	13 6 8
Mill expense	...	2 8 9
Stamps	...	0 16 8
Legal expense	...	35 14 7
Interest	...	8 17 $9\frac{1}{2}$

	£	s.	d.
General expense	2	0	2½
Fire insurance	48	18	7½
Freight	71	12	10
Advertising	15	10	0
Travelling	17	11	5½
Drying rack	4	19	0
Harness account	9	0	2½
Planting	10	16	8
Machinery repairs	2	1	3½
Clearing account	26	0	10
Total cost of growing crops, 595 acres, to 1st March, 1903,	£5,277	15	0

Cost per Ton of Fibre. £ s. d.		Gross Cost. £ s. d.
2 1 1	Labour, material, &c., to maturity ...	5,497 10 11
	This amount has been expended on 595 acres of now mature and growing plants, expected to yield nine crops. This is equal to £1 0s. 6½d. per acre, or £2 1s. 1d. per ton of fibre.	
8 14 10	Harvesting — Labour by contract — 31¼ tons fibre baled and loaded on to cars ...	273 8 9
1 13 3½	Team account—Feeding animals	52 1 1½
3 2 1	Fuel and machine oil used while harvesting 31¼ tons fibre	96 19 11
	Rent of land	49 8 0
2 0 7	7 per cent. on receipts for 24⅓ tons, netting £706 4s. 9d.	
2 16 8	Fibre transportation— For 24⅓ tons, including marine insurance...	66 4 0
Total £20 2 1		

PRODUCTION AND PROFIT TO DATE (MAY, 1903).

	£	s.	d.
24⅓ tons already sold at 7½ cents (3¾d.) lb.	771	18	9
*24 tons (20 at mill and 4 unharvested), valued at 7½ cents (3¾d.) per lb.	750	0	0
Gross sales	£1,521	18	9
Less cost per ton— 48⅓ tons at £20 2s. 1d.	980	18	5½
Net profit	£540	19	3½

We need give no further particulars beyond stating that the estimated crop for the rest of the year 1903—*i.e.*, from March to December—was valued at £2,625 0 0

	£	s.	d.
Less cost of production of 90 tons fibre at £20 2s. 1d. per ton	1,809	7	6
Estimated profit	£815	12	6
Estimated sale of plants	520	16	8
	£1,336	9	2

* Since sold at 8 cents (4d.) per lb.

The enterprise at the date referred to had hitherto been conducted on an experimental basis at Hawaii, and consequently the cost of production given above is very high. The following table represents the cost anticipated by the company for future crops:—

		£	s.	d.	
Clearing, planting, cultivating ...		2	1	6	per ton fibre
Harvesting, clearing, baling, &c. ...		7	5	10	"
Feeding teams		1	0	10	"
Fuel and machine oil		1	0	10	"
Transportation and marine insurance...		2	1	8	"
Rent of land, 7 per cent. on £20 16 8 per ton					
Less transportation 2 1 8					
	£18 15 0	1	6	3	"
Taxes and incidentals		0	11	10	"
Total expenses delivered in San Francisco		£15	8	9	"

As sisal fibre is worth to-day £35 per ton, the profit amounts to £19 11s. 3d. per ton.

It should be remembered, however, that large companies pay good salaries to managers and overseers—an item which does not enter into our calculations for carrying on the industry by co-operation amongst farmers who require no managers or overseers.

MISCELLANEOUS DATA.

	£	s.	d.
Present average cost of clearing, per acre	2	10	3
Present average cost of planting, per acre	0	19	9½
Present average cost of weeding, per acre	0	10	10
	£4	0	10½

On one Queensland plantation, near Brisbane, the cost of clearing the land of a heavy second growth of timber was ... ... £1 10 0 per acre

Cost of holing and planting	1	4	0	"
Cost of cleaning off weeds and undergrowth ...	0	5	0	"
	£2	19	0	"

As compared with £4 0s. 10½d. per acre in Hawaii.

ABOUT RUBBER.

It has been abundantly proved that the climate of North Queensland is most favourable to the growth of various kinds of rubber-producing plants, and that a rubber plantation will in a very few years bring in very large profits to the owner. Whilst, however, the Queenslander has been thinking about planting and many have been making experiments with half a dozen trees, unmindful of the fact that all experimental work has long since been done at the Kamerunga State Nursery, at Cairns, the wide-awake planters in Ceylon have gone earnestly into the business, with the result that there are now nearly 40,000 acres of the island planted with 2,589,377 trees. These rubber-trees represent a value of £1,174,200, or an average of £30 per acre. Of these, about 70,000 are already bearing, and every year brings on more trees, sufficiently mature to be tapped. By the end of 1905, it was estimated that 40,000 additional acres would be planted with rubber. To give some idea of the energy with which the rubber industry is being carried on in Ceylon, it may be

mentioned that last year no less than 4,000,000 seeds were sold and eagerly bought at 1d. each, and the whole of these have been planted, yet this probably represents only one-half of the total plantation that has gone forward in the island during the past twelve months. This far surpasses anything hitherto attempted in any other part of the world, for even in the Congo (South Africa) the much-vaunted 60,000,000 rubber-trees include not only those under cultivation, but all the rubber vines and plants known to exist in a wild state, and the figure at best is a mere piece of guesswork.

It should be noted that all the rubber now being collected in Ceylon is from early-matured trees—that is to say, trees three and four years old; for there are few cultivated trees in the island over four years old. Whereas in other parts of the world Para rubber-trees take from eight to ten years to mature, in Ceylon they can be tapped when only half that age. There are a few old trees at Heneratgoda which were planted in 1876, at distances of 10 feet apart. These trees have attained a trunk height of 89½ feet with a girth of 81 to 82 inches and up to 120 inches.

On the General Ceylon Tea Estates Company's property there are 700 acres of rubber-trees, of which 7,888 are seven years old; 17,079, three years old; 34,894, two years old; 23,889, one year old, growing altogether on 419 acres, the balance being in course of planting. From the older trees, 2,200 lb. of rubber were obtained in 1905, and the estimate for the year 1910 is 50,000 lb., the yield being 1 lb. per tree. Last year the crop netted £425, or at the rate of 5s. 3½d. per lb. net. The cost of harvesting was about 9d. per lb., placed f.o.b. in Colombo. It is easy to calculate the profit of an acre if it yields 200 lb. of rubber which sells at 5s. net. It seems fabulous, yet others are equalling or even surpassing this profit. Is it any wonder there is an appreciation of the value of rubber estates?

And what about Queensland as a field for the rubber industry? Our soils are superior to those of many rubber-producing countries; our climate is an ideal one for tropical products. Why then do we not make a start to compete with other countries whose advantages are admittedly inferior to ours? Fortunes are being made in Mexico, the Bahamas, the Hawaiian Islands, and in other countries in sisal hemp; fortunes are being made in many tropical countries in rubber-growing. How can we account for Queensland's apathy? We can only suggest that it lies in want of energy and enterprise.

RICE-GROWING ON THE ENDEAVOUR RIVER.

From Mr. A. M. Nickle, Cooktown, we have received some notes on rice-growing, based on a statement that there does not seem much prospect of the industry ever attaining prominence in Queensland. Our correspondent writes:—

"If the writer had stopped at rice on dry land he would have been right. Rice is a swamp grass, which does not suit dry land. 'Swamping' is an expensive business, and, unless a crop can be grown to pay well without protection, to attempt to develop the industry by protective duties is unsound policy. The first rice grown on the Endeavour River was a Malay variety. It yielded heavily, and proved able to withstand drought, but after it had been grown for several years it developed blight on the dry land. The blade remained green and healthy until it attained a height of about 8 inches, when it turned black and the plants died back. I had a small plot growing on low ground which was covered with water during heavy rains to a depth of 2 feet. When the rain ceased, the water gradually soaked into the soil. No blight ever attacked this portion of the crop, from which a heavy yield always resulted. During one season a portion of my cultivation was constantly soaked by water oozing from the high land. This portion produced 120 bushels of paddy per acre, whilst that on the dry land only produced 80 bushels. (*Only* 80 bushels? Ed.)

A bushel of rice paddy is reckoned at 42 lb., and it takes 75 to 85 bushels to make 56 lb. of clean rice. The Malay rice I sold at 1s. a mat higher than China rice. The variety grown here lately is called Cairns rice, and the Chinese value it at 2s. a mat less than China rice. Should it experience a long spell of dry weather during growth, it will produce no grain. Our principal drawback in growing rice on dry land is the presence of a quick-growing grass, which we call 'crow's foot' to distinguish it from other weeds. It produces a large quantity of seed, which lies dormant in the soil, until the wet season, when it germinates, and within six weeks is ready for cutting and turning into hay. Where rice is planted in drills, a large portion of this grass can be destroyed by the horse hoe; but it requires hand-hoeing as well. The Chinese do it all by hand, but they complain that it is 'too muchee labour.' After the hoeing is completed, a dry spell when the rice is coming into ear may cause a failure in the crop, and all the labour is lost.

"Experimenting with rice on dry land is of no value in this part of Queensland, whatever it may be in the South. If the Department of Agriculture could see its way to experiment with swamp rice, men who have a water supply would be encouraged to give it a trial. Rice grows well in damp ground, or in water up to the top flag, the latter floating on the water. Twenty-four hours under water will not kill it. It can be sown on flat swamp land; but if the land requires a ditch on the low side, which makes the water uneven in depth, the young seedlings must be transplanted; a few stalks stuck in the mud in the exposed parts at distances of 15 inches apart is sufficient. Raising rice in this fashion is far easier and quicker than when the crop is grown on dry land and has to be hoed."

We shall be pleased to hear more on this subject from our correspondent, with the addition of some information concerning the present state of the industry in the Cook district. If 120 bushels of paddy can be obtained as an average crop per acre, it seems strange that every swamp in the North is not availed of for the crop. Paddy used to sell in the Logan district at 6s. per bushel. If the price were 5s., the gross value of the produce of 1 acre of Malay rice would be £30. The labour, once the sowing is done, would be nil, seeing that the crop is growing in the water and that no hoeing is required. The only other expense would be the harvesting. There must be some potent reason which deters men from carrying on what, on paper, seems to be a most lucrative business in the North.

NEGLECTED INDUSTRIES.

VANILLA GROWING AND CURING.

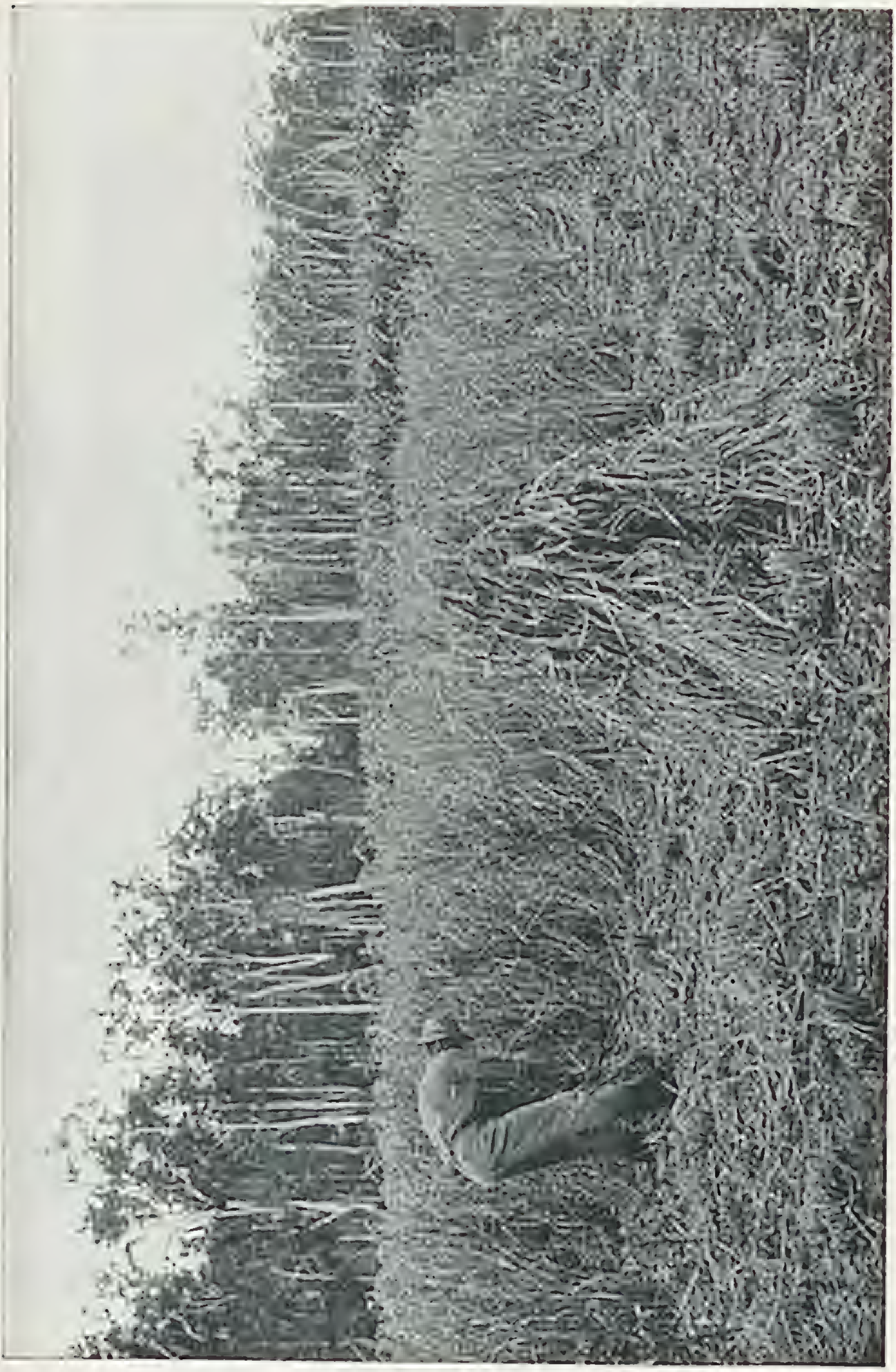
The success which has attended the experiments in vanilla-growing, carried out last year by Mr. H. Newport, manager of the State Nursery at Kamerunga, Cairns, and instructor in tropical agriculture, should have the effect of inducing farmers in the tropical coastal portions of Queensland to devote a portion of their time to the production of vanilla beans. There are eight known varieties, five of which are indigenous to Mexico. The three best known to commerce are *Vanilla planifolia*, *V. sylvatica*, and *V. pompona*. Mr. A. McFarlane, a Tahiti planter of great experience, some time ago contributed a very valuable essay on the subject of vanilla-growing on that island, to the "Bulletin of Miscellaneous Information," of Trinidad, W.I., from which we gather what here follows:—

Vanilla is produced by a terrestrial, climbing vine, belonging to the Orchid family, which, like many of its relatives, lacks the power of self-fertilisation, and must, therefore, be fertilised by hand. The *V. pompona* yields what is known in the English market as vanillos. The other kinds have been long since discarded in its favour; but of late *V. planifolia* has come to be much appreciated. The bean of the latter is long, thin, and round; *V. pompona* has short,

Plate XIV.

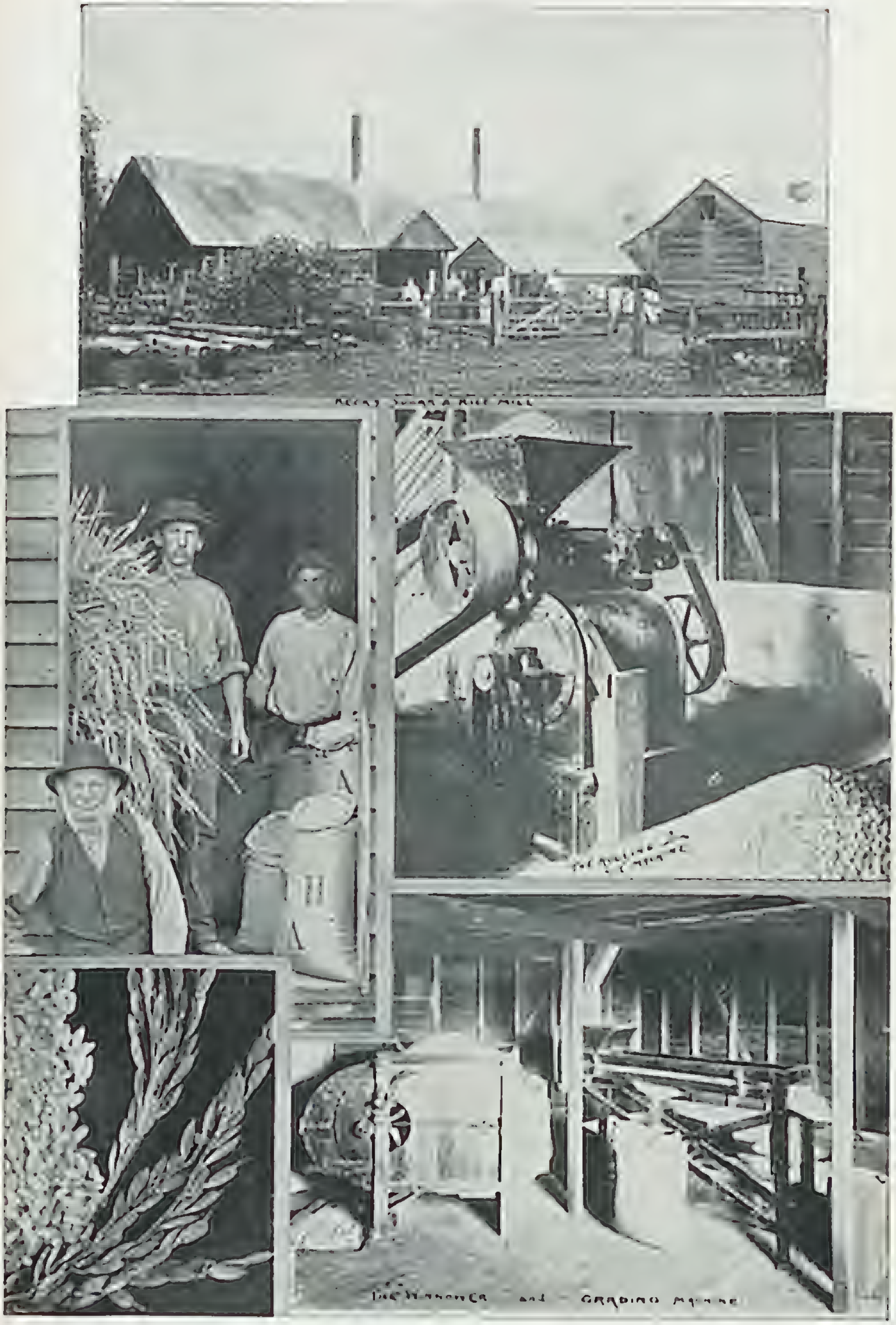
Rice Land at Pimpama.

Plate XV.



Harvesting Rice at Pimpama.

Plate XVI.



Rice Mill, Pimpama Island.

Plate XVII.

Head of Rice and Hulled Rice.
Natural Size.

thick beans, which can be left on the vine until they are brown. The beans of *V. sylvatica* are very long, they split badly, and must be gathered early in order to save them.

From the nature of the vine, it is at once seen that it will not thrive everywhere. Vanilla revels in moisture (but it wants no stagnant water about its roots), and a hillside is, therefore, well adapted to it. Heavy dews almost obviate the necessity for rain. The vine also delights to send its roots round and amongst rocks in search of nutriment and moisture. On hillsides the vine becomes healthier and stronger than on flat ground, the beans are longer, and the longest beans command the best price. Therefore, eschew level ground, choose a moderate slope, if possible, in a valley.

There are two ways of starting a plantation. The first is to cut away such of the trees originally growing on the land as may be necessary, saving such as may be required for shade or to grow the vines upon, filling in the gaps with posts.

The second is to chop everything off the ground, and to plant posts of such trees as will grow from cuttings, or else plant young trees at regular intervals. This plan gives the prettiest plantation, but takes longer before it brings in any returns, and the original cost is more. Whichever mode is adopted, never resort to fire as an aid to clearing. Chop the trees and branches into small pieces, and leave them to rot on the ground as food for the vanilla. The scrub trees of Queensland very soon rot after felling. The posts should be from 3 to 8 inches in diameter and 7 or 8 feet long. The mango, *Ficus elastica* and *indica*, *Jatropha Curcas*, and *Manihot*, *Dracæna tesselata*, &c., are good trees to use for the purpose. The three last grow rapidly, and furnish plenty of shade. The candle-nut tree also makes good posts; 6 feet by 8 feet, or 8 feet by 8 feet, is a good distance to leave between the posts. When a post rots and falls, it is better to plant a new post and new vine than to put the old vine on a new post. This refers to vines and posts three or four years old.

Vanilla may be raised from seed. The seeds are first washed many times with strong soapsuds to remove the greasy matter which envelops them. They are then exposed to the sun till dry, and are then mixed with fine sand to separate the grains, after which they are sown in boxes in soil composed of equal parts of humus, sand, and fern soil. With care and watering and a moderate exposure to the sun, it is possible to obtain the young plants.

But the best plan is to cut vanilla vines into lengths of three or four joints, and plant them in a bed composed of decayed leaves and leaf mould. By keeping them well watered and shaded, in a couple of months they will have made good roots, and can be removed to the plantation. This is preferable to planting small cuttings at once in place. Such plants will not give a crop under two or two and a-half years. In Tahiti, the plan followed is to plant vines of 3 or 4 yards in length. These will give a few beans in a year or eighteen months from the time of planting. Whether a vine of six joints or one of 6 yards is to be planted, the method to be followed is the same. A slanting hole is made about a foot from the post and a couple of inches in depth. Into this the end of the vine is inserted, and the soil pressed tightly round it. The vine is then laid flat on the ground from the hole to the post, and tied to the post. The part on the ground should be of a length of two or three joints. This is thickly covered with rotten and dead leaves and rotten wood, and on top of all one or two stones to keep the vine and its covering in place. While the vine emits roots at its cut end, still the strongest roots are sent out at the joints, hence the necessity for covering one or two of these. The best time to plant is at the beginning of the rainy season. As the vanilla vine is essentially a surface feeder, it is not only unnecessary but harmful to dig or plough the land. It is, on the contrary, very necessary to keep the surface covered with decaying vegetable matter. If the trees supporting and shading the vines do not yield sufficient material, then apply a coating of rotten leaves and stumps of bananas, cocoanut leaves, stable manure, guano, &c. Artificial manures should not be

used. A nice-looking weeded plantation is a mistake; weeds of various sorts act as a mulch for the surface-feeding roots.

After the vines are planted, all the care that the plantation requires, until the blooming begins, is to keep the growing plants pruned, and in case any of the vines grow too high, to turn them down. The turning down is a most important operation, and must not be neglected. At least every two months vines which have reached a height of 10 or 12 feet should be carefully loosened from the tree for the upper half of their length, and hung over convenient branches. These hanging vines are the ones which produce the flowers. Hence the necessity for turning down. As long as the vine can continue climbing it will not bloom. Do not let the vine hang nearer than a foot from the ground. Pinch in the end when it has reached that length.

When fruit trees run too much to wood they do not give a full crop. It is the same with vanilla. Rank-growing vines must be kept within bounds by pruning. The plant is benefited by removing old vines which have borne. If cut off close to the top of the post, the plant will replace them with one of the full necessary length by next flowering season, which will give more bloom than the old one would have done and probably produce better beans.

The flowers only remain open one day, and all that are open must be fertilised on that day, and before 3 p.m., at which time they begin to close. A quick worker can fertilise from 2,000 to 3,000 flowers in a day of eight hours. The operation is simpleness itself, and can be learned in five minutes by watching one who already knows how to do it. To explain it in writing is more difficult. The only tool required is a small pointed stick similar in size and shape to a small toothpick. Holding the flower in the left hand, the "petticoat" or lip is stripped down, exposing the column, the top of which is then held between the finger and thumb. The point of the operating stick is now drawn upward, raising the cover of the stigma and the anther, which by a gentle pressure of the finger and thumb holding the column are kept open, while with the point of the stick the pollen mass is removed from the anther and placed under the cover of the stigma. The pressure of the fingers being removed, this flies back into place and holds the pollen securely, and the flower is fertilised. If the operation is carefully performed, very few fail. The flower is upon the end of a slim round stem, usually about 2 inches long. This is the bean in embryo. By the second or third day the bean will have grown sensibly longer. The column remains attached to the bean until it is nearly ripe—that is, for seven or eight months. From the time the flower is fertilised the bean grows very rapidly, attaining its full length in about three months.

When the beans have assumed a distinct yellow colour they are ready for gathering. This will be in nine months after the flowers appear. Each bean should be removed singly, care being taken to separate the bean at its junction with the stem, as the upper end is easily broken. Never cut the whole bunch because one bean is seen to be ripe.

CURING.

Next comes the curing. Anyone can grow vanilla, but it requires care, experience, and constant attention to cure it well. By following the methods here given the beginner cannot go far astray.

The beans when gathered are taken to the curing-house and spread out, where the sun cannot reach them, 6 or 8 inches deep, on the floor or shelves, till they turn brown. This takes from one to three weeks, depending on the state of maturity of the beans when picked. Beans picked too soon may take six weeks to turn brown. When they have arrived at a uniform colour (a deep red brown) they can be exposed to the sun in wooden trays 3 feet by 6 feet and 2 inches deep. In these the beans are spread about $1\frac{1}{2}$ inches deep. They need not be covered with blankets for the first two or three days of exposure. They should be turned two or three times during the day. This applies to the whole period of curing, and is a most important point. If neglected, some of the beans are sure to be burnt red by the sun. About 3 p.m. the trays are removed

to the house, stacked one above the other, and covered with blankets. The beans thus retain their heat during the night. At the close of the third or fourth day the beans are removed from the trays and packed while hot into tins and closely covered (40-lb. biscuit tins are the best). Here they remain for a couple of days, when they are again exposed in the trays to the sun. On being removed from the tins the beans will be found to have sweated and are covered with moisture, and there will be a good deal of water in the bottom of the tins. After this first sweating the beans must never be exposed to the sun unless covered with blankets. Dark blankets are the best. From this time onwards these processes are alternated—a day in the sun and a day or two in the tins—until the beans are nearly dry. When, however, they have begun to shrivel and are soft and pliant, they may be left for a couple of weeks at a time in the tins without sustaining any damage, but the latter must be as nearly airtight as possible. The bean must not be too dry. It must be of a dark chocolate brown, pliable but not "mashy." Never expose them to the sun less than 1 inch in depth, or the stalk end of some will surely burn.

Measuring.

The beans having been properly cured, have now to be measured. A board, 3 inches wide and 14 inches long, is marked from 4 to 11 inches. Neither of these extremes is often used. The measurer sits at a table, and having previously sorted his beans (with the blossom ends all one way) he takes a handful in his left hand, and measures them one by one on the board, placing equal lengths in different heaps on the table. When the measuring is finished, the beans are tied in large bundles, and the length noted on an attached label. The bundles are then packed in a tin. To make a bundle, take first sufficient beans to form a moderate handful. These will be found to range from seventy for the longest to ninety for the shortest beans. From the handful select the best and straightest (sixteen for a bunch of fifty up to twenty-one for a bunch of ninety) and lay them on one side. These are to form the wrapper. The stem ends of the beans all turn to one side, so that in making the bunch these ends must be turned inwards. When the bunch of beans is nicely levelled at the ends and squeezed together, the wrapper beans are put on one after the other till the bunch is encircled by them. Then a string is tied fairly tightly round the middle, and with a little manipulating to make a nice even package, the bundle is finished. The bundles are then wrapped in paraffin paper and packed tightly in tins holding about 85 lb. each. These are soldered airtight, and packed two in a crate for shipment. Treated thus they will keep for years.

Yield per Acre.

The yield is, of course, variable, depending on the number of plants per acre, their age, &c. A plantation which will give 200 lb. of cured beans per acre is a good one, although 250 lb. can be grown. A 5-acre plantation will keep two men constantly employed, and extra labour will be required during the flowering season and also for drying the beans. Each thousand flowers fertilised should produce 5 lb. of cured beans, allowing for 25 per cent. loss. The loss of weight in drying is about 75 per cent. The present value of cured vanilla beans in London is from 3s. to 11s. per lb., according to length of bean, and from 3s. to 5s. per lb. for split beans.

COMMONWEALTH WHEAT YIELDS FOR 1905-6.

It is estimated that the wheat crop in Queensland will yield about 1,000,000 bushels, averaging 15 bushels per acre. The New South Wales crop is set down at probably 20,488,800 bushels, with an average of 12 bushels per acre. The Victorian returns are expected to reach 21,543,150 bushels, the average per acre being 16 bushels. The South Australian crop in all probability will be found to exceed 18,000,000 bushels, averaging 10 bushels per acre.

Science.

ARTIFICIAL INSEMINATION.

BY J. WASHINGTON IRVING, M.R.C.V.S. L.

Fifteen months ago I wished to breed from my greyhounds, and, as the dog was indifferent to the bitch, I had to resort to artificial means, with the result I produced nine perfectly developed and healthy puppies, six dogs and three bitches.

Dog, Winning Hazard, black, three years old (three firsts, special, and champion, Kennel Club, Queensland, 1903; first, Kennel Club, New South Wales, 1903; first, champion and challenge certificate, Queensland National Association, 1905; and first and champion, Kennel Club, Queensland, 1905).

Bitch, Nightcap, black and white, four years old (three firsts and champion, Queensland Kennel Club, 1904).

One of the puppies, Night Hazard, black dog (whose photograph appears in this article), was shown and got second prize at the Queensland National Association Society's Show, 1905, and first and two second prizes at the Queensland Kennel Club, 1905.

I have successfully conducted this operation on seven different occasions on the dog.

It may be resorted to in cases of mange in either the dog or bitch, or in a case of a bitch recovering from a fractured hind limb, but chiefly when the dog or female are indifferent to each other.

These are the first cases recorded in Queensland of artificial insemination in the dog.

In horse-breeding it has been carried out for several years.

This season I have conducted ten experiments with mares, and cannot ascertain the results till next year.

It is most valuable in mares and cows, as there are lots of mares who continually take the horse, but do not prove in foal, due to some fault of their wombs, such as injury to the neck of the womb or tightness, interfering with the proper passage of the seminal fluid into the womb, which artificial insemination overcomes.

If a mare horses and requires serving more than twice, she then should have the neck of her womb examined by some competent person, when some trouble will be found, and the inseminator used.

The whole secret of breeding is the bringing together of the male and female seeds in the womb at the proper time, when a new being will be produced, no matter by what means the male seed (spermatozoa) gets there.

Seminal fluid collected from the male will live, exposed to the air, in a cup or open vessel for nine to ten minutes.

From an experimental point of view, it is hard to say what one might not produce in the way of hybrids.

In a future Journal I will give the results of this season's experiments.

ANALYSES OF QUEENSLAND GRASSES.

BY J. C. BRÜNNICH, F.I.C., ETC., Agricultural Chemist.

It has always been a well-recognised fact that Queensland possesses a very large number of highly nutritious indigenous grasses, which under our exceptional favourable climatic conditions and the help of rich soil respond to a slight shower of rain, and recover with almost miraculous rapidity after years of drought.

The long period of dry weather, through which the whole of the Australian continent has passed lately, should have been a lesson to our farmers

Plate XVIII.

J. Washington Irving's Greyhound Dog, Night Hazard.
(Artificially Inseminated, October, 1904.)

and pastoralists, and should have taught them the importance of looking ahead and preserving for future use as much as possible of the heavy crops of grass, which in the years of plenty largely go to waste and become a prey to the periodical bush fires.

On our State Farm at Gindie, near Springsure, on the Central Railway Line, which is at present chiefly devoted to stock-raising, a large number of various grasses are grown under ordinary conditions, and the manager was instructed last year to collect samples of such grasses for the purpose of having them analysed. The value of these samples was enhanced by the fact that they were collected from measured square yards, in order to obtain some idea of the actual crop per acre, and furthermore by being able to compare the analyses of the varieties with the analyses of ordinary *bush hay,* kept for different length of time, and collected during and towards the end of the period of drought. The result of the investigation is interesting and valuable, and shows how well bush hay may be kept for a considerable period and still retain highly nutritious qualities; again, it shows how certain varieties of grasses, which always have been recognised as good fodders, have their value confirmed by the analyses.

I must here explain to some of our readers that the food value depends in the first instance on the total amount of *dry matter;* secondly, on the *composition* of this dry substance; and thirdly, on the *digestibility* of the constituents of this substance. The most important valuable ingredients of fodders are:—

Albuminoids, or "*flesh formers,*" nitrogenous substances like gluten of wheat flour and white of an egg.

Carbohydrates, like starch, sugar, and fibre } "heat producers."
Fats and oils,

Mineral matters, found in the ash of fodder plants, which, like phosphoric acid, lime, salt, &c., are absolutely necessary to the animal. By comparing the amounts of albuminoids with the amount of "heat producers," we obtain the *albuminoid ratio.* For the calculation of this ratio the amounts of the digestible portions only are compared, and the value of fats and oils is taken to produce 2·3 times the amount of heat than ordinary carbohydrates. Not only the composition but also the digestibility of the foods will vary with the state of maturity, and will be influenced by conditions of seasons and soil, and for this reason investigations of this nature should be repeated to cover different parts of the State, in order to find out which is the most valuab'ˎ a l profitable grass to grow in each locality.

The digestibility of the ingredients of a fodder differs considerably between the various classes of animals, as already pointed out in the several articles which appeared in this Journal (Vol. I., page 141, Vol. IV., page 245, &c.). Bulky foods, like straw and hay, are always better digested by ruminants, like cattle and sheep, than by horses. Other foods, like lucerne hay, maize, &c., are equally well digested by horses, cattle, and sheep.

	Ruminants (cattle, &c.) Digest— of ordinary Meadow Hay.	Horses Digest—
Of nitrogenous substances	57 per cent.	57 per cent.
Of fat	53 „	24 „
Of carbohydrates	64 „	55 „
Of woody fibre	60 „	36 „
Of total organic matter	61 „	48 „

In order that any animal may grow and thrive, it must not only consume a certain amount of food, but the albuminoid ratio must not fall below certain limits. An animal could, for instance, not be kept alive for any long period on a food like molasses, which only contains a very high amount of carbohydrates in the form of sugar, but would do well if with the molasses a certain amount of material comparatively rich in nitrogenous matter, like lucerne hay, bran, pollard, or cotton-seed meal, would be supplied.

The albuminoid ratio may vary between 1 part of albuminoids to 5½ parts of carbohydrates, like in the case of milch cows, heavily-worked horses, young stock, and 1 part of albuminoids to 8 parts of carbohydrates for cattle at rest and old sheep.

I give herewith the notes made by our esteemed Government Botanist, F. Manson Bailey, in his catalogue of Queensland grass, on some of the varieties:—

Andropogon sericeus, R. Br. The Blue Grass of Queensland. This is looked upon as the best of all the indigenous grasses. Is generally found growing upon rich land, furnishing excellent pasture and hay. It seeds freely, and is of very rapid growth. Met with in Central Australia, Western Australia, New South Wales, and throughout Queensland.

Astrebla pectinata, var. curvifolia, Bail. Curly Mitchell Grass. An erect tufty grass, with much-curved leaves; one of the best grasses of the Diamantina and Georgina Rivers.

Astrebla pectinata, var. elymoides, Bail. Weeping Mitchell Grass. This is a weak, straggling grass, sprouting at the joints after every shower of rain, and affording a large amount of excellent fodder. So far as at present known, peculiar to Queensland, and a great favourite with stockholders.

Eriochloa punctata, Hamilt. (*Panicum helopus, Milium punctatum*, Linn., R. Br., Prod.; *Paspalum punctatum*, Flügge.) A fine pasture grass, of a glaucous colour, always in growth, sweet and nutritious, excellent for hay. Found on every kind of soil, and as widely spread as the former, being common in the tropics of both the new and the old world; throughout Queensland, New Guinea, and New South Wales.

Pollinia fulva, Benth. (*Saccharum fulvum*, R. Br.; *Erianthus fulvus*, Kunth.) Brown Top or Sugar Grass. A tall grass, usually met with on wet land. Produces a good deal of sweet fodder, much relished by stock; thus often closely cropped. The rich brown silky spikes of flowers have procured for it the one local name, and its sweetness the other. Met with through Australia.

Ischæmum laxum, R. Br. (*Andropogon nervosus*, Rottb.; *Hologamium nervosum*, Nees.) Rat's Tail Ischæmum. This is a coarse grass, often met with at the base of hills. Before seeding it affords a fair pasture for cattle, but not adapted for sheep. The species is widely spread in Queensland, and extends also to Tropical Asia and Africa.

Anthistiria membranacea, Lindl. (*Iseilema Mitchelli*, Anders.) The Landsborough Grass, Red Gulf Grass, and Barcoo Grass. A grass well worthy of extensive cultivation both for feeding or hay, of rapid growth when under cultivation, the stems long and weak, forming an entangled mass 1 to 2 feet deep. This grass is very brittle—thus it is much broken by stock—but it is said that stock are so partial to it that they often lick up the broken pieces off the ground. Found in Queensland and Central Australia.

The sample of Teosinthe was grown at the Biggenden State Farm, and was harvested in April, 1905. The manager reported that the crop was not quite mature, and that the cattle do not care much for it.

For comparison, I give the analyses of oaten hay and wheaten hay grown in England, and also the analyses of a sample of couch grass, which is one of our most nutritious and milk-producing grasses, and of paspalum grown at the Agricultural College, at Gatton. Of the grasses grown at Gindie, *Eriochloa punctata* and *Panicum jutiflorum* are the richest fodders, whereas the favourite blue grass gives the heaviest crop of hay. The crop of Teosinthe, although weighing nearly 40 tons per acre, contains much less dry substance and feed than any of the indigenous grasses.

I must add that in the tabulated report of the analyses only the usual practical results were given, and that the analytical work carried out was much more comprehensive, as starch, pentosans, and other bodies were determined by various recent methods, which will be reported in another paper.

Number of Analysis.		Water.	Total Dry Substance.	Albuminoids.		Fat.	Chlorophyl, Amides, &c.	Fibre and Carbohydrates.		Ash.					Albuminoid Ratio.	Crop. Tons per Acre.	
				Soluble.	Insoluble.			Digestible.	Woody.	Soluble.	Insoluble.	Lime.	Potash.	Phosphor. Acid.		Hay.	Grass.
201	Bush hay, 1 week old	7·80	92·20	·12	2·51	1·54	7·79	31·59	41·42	2·05	5·18	·44	·70	·19	1:31	...	...
202	,, 2 months old	6·53	92·47	·68	4·87	1·94	10·09	31·00	39·78	2·20	3·91	·81	·83	·27	1:15	...	...
203	,, 12 ,, ...	6 93	93·07	·34	2 04	1·12	4·54	32·46	45·26	1·35	5·96	·41	·48	·16	1:36	...	...
204	,, 18 ,, ...	8·29	91·71	·26	2·39	1·58	12·11	27·80	39·14	5·65	2·78	·27	2·57	·47	1:29	...	...
206	Blue grass (Andropogon sericeus)	7·03	92·97	·89	2·23	1·70	8·36	27·13	43·26	3·35	6·05	·41	1·11	·27	1:25	6·48	10·80
205	Weeping Mitchell grass (Astrebla pect. var. elym.)	6·98	93·04	·41	3·35	1·70	8·64	29·89	41·66	3·15	4·22	·38	1·53	·30	1:22	5·94	14·58
207	Curly Mitchell grass (Astrebla pect. var. curv.)	6 96	93·04	·88	3·53	1·58	8·54	29·64	41·70	4·20	2·97	·41	1·11	·29	1:18	5·40	10·80
208	Eriochloa punctata	6·52	93·48	1·04	4·97	1·66	8·40	27·80	38·26	7·50	3·85	·48	3·77	·49	1:12·5	4·86	12·96
209	Brown-top or Sugar grass (Pollinia fulva) ...	7·57	92·43	·63	2·36	1·46	8·16	30·52	41·31	1·80	6·16	·26	·59	·21	1:27	5·40	8·61
210	Rat's-tail (Ischæmum laxum)	7 07	92·93	·81	2·13	1·40	6·01	28·64	43·38	1·90	8·63	·34	·89	·40	1:27	4·32	7·02
211	Panicum jubiflorum	6·60	93·40	·99	4·63	1·46	11·15	26·23	39·26	4·45	5·23	·32	2·56	·22	1:13	5·40	15·12
212	Flinders grass (Anthistiria membran.) ...	7·88	92·12	·07	2 74	1·40	9·43	26·92	39·76	2·15	9·65	·29	1·12	·32	1:27	?	?
	English oats, over-ripe (analysed by Dr. Voelcker)	16·00	84·00	1·29	2·36	1·25	3·19	27·75	41·82	6·31		...	...	...	1:21	...	...
	Irish wheat, green, turning yellow (analysed by Sir C. A. Cameron)	13·00	87·00	1·25	1·26	1·22	4·18	75·84		3·25		...	...	...	1:34	...	...
213	Teosinthe (grown at Biggenden)	6·03	93·97	1·33	4·29	1·14	6 78	32·83	38 62	3·65	4·33	·55	1·42	·19	1:14	2·57	39·43
	Couch grass (Cynodon dactylon) (Grown at Agricultural College.)	9·98	90 02	2·59	7·13	1·15	13·17	33·76	22·17	4·78	5·27	·42	1·40	·37	1: 6·5	...	...
	Paspalum dilatatum ... (Grown at Agricultural College.)	10·72	89·28	·96	3 85	2·03	10·88	26·97	34·45	6·06	4·08	·25	1·13	·35	1:15	2·86	10·53

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1904.	1905.											
	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
North.													
Bowen	4·33	22·69	0·50	1·17	5·72	0·74	0·53	0·39	0·06	4·03	0·05	3·91	0·04
Cairns	7·88	25·74	8·59	6·81	6·92	3·89	1·94	0·43	2·27	Nil	0·46	1·72	0·53
Geraldton	7·35	28·37	5·71	8·26	20·51	13·35	9·39	2·41	3·88	Nil	0·22	5·44	1·14
Herberton	2·06	7·39	3·37	0·75	2·41	2·67	1·17	0·05	0·89	Nil	0·21	1·69	0·51
Hughenden	0·28	3·37	0·07	0·70	3·84	Nil	0·41	0·47	Nil	Nil	0·13	0·07	0·14
Kamerunga	11·62	29·08	7·56	4·38	8·89	5·63	2·59	1·11	2·16	Nil	0·63	1·05	0·33
Longreach	1·34	1·17	0·53	0·17	2·41	Nil	Nil	0·22	Nil	Nil	0·06	0·77	0·17
Lucinda	2·10	15·40	1·68	2·79	23·06	3·15	1·92	4·14	0·89	0·15	0·68	2·03	0·95
Mackay	1·52	29·89	4 73	3·67	13·19	2·17	1·82	0·95	0·66	0·97	0·08	2·45	0·70
Rockhampton	1·60	15·39	0·92	0·09	8·93	0·95	0·54	0·26	0·51	0·70	0·91	1·05	4·77
Townsville	5·70	13·71	1·97	2·02	6·41	0·52	0·35	0·68	0·06	...	0·52	0·19	Nil
South.													
Barcaldine	6·54	1·85	0·12	0·25	1·56	Nil	Nil	0·30	0·04	Nil	0·15	1·49	1·30
Beenleigh	4·55	5·44	3·04	2·91	3·63	2·21	0·40	0·27	1·12	1·15	2·82	*1·76	3·77
Biggenden	5·89	13·05	1·94	3·61	3·81	1·46	0·60	0·28	0·10	0·79	2·56	1·14	11·66
Blackall	5·04	3·19	0·23	2·34	5·02	0·21	Nil	0·68	0·04	Nil	0·29	1·45	0·83
Brisbane	3·65	9·09	2·64	2·65	4·50	1·10	0·39	0·28	0·65	1·32	2·22	3·63	8·21
Bundaberg	5·16	16·67	2·17	3·35	6·31	4·26	1·10	0·71	0·17	0·95	2·37	0·95	6·74
Caboolture	7·36	8·10	3·43	3·57	4·89	1·65	0·26	0·05	0·36	0·98	2·73	2·88	*6·72
Charleville	2·51	1·70	0·73	1·67	3·87	0·63	0·01	0·15	0·14	0·09	0·99	0·68	0·12
Dalby	2·15	3·40	0·74	5·46	3·09	2·19	0·25	1·15	0·76	0·14	2·09	1·60	5·67
Emerald	2·44	7·77	0·25	1·76	6·00	0·72	0·06	0·50	0·30	0·29	0·64	4·41	0·80
Esk	3·07	8·26	0·85	1·87	3·52	1·68	0·33	0·52	0·57	0·65	3·21	3·65	5·98
Gatton College ...	2·42	5·57	1·10	1·71	4·22	2·56	0·26	0·98	0·27	0·54	2·59	3·59	4·73
Gayndah	2·36	11·34	0·82	1·58	4·06	1·07	0·42	0·54	0·25	0·30	2·38	1·52	5·58
Gindie	2·02	7·07	0·06	1·74	7·44	0·41	0·11	0·37	0·09	Nil	1·11	3·79	Nil
Goondiwindi	1·62	3·37	0·87	2·53	6·49	1·23	0·55	0·52	0·58	Nil	3·57	1·51	2·72
Gympie	3·94	9·75	2·29	2·00	7·05	4·49	0·79	0·78	0·70	1·85	1·48	1·44	5·03
Ipswich	4·25	6·87	1·30	1·85	2·86	1·98	0·50	0·44	0·78	0·70	2·91	3·32	3·64
Laidley	5·26	9·93	2·33	2·17	4·11	2·59	0·56	0·56	0·61	0·30	2·36	3·59	3·73
Maryborough	2·33	20·69	2·67	2·78	3·48	3·56	1·21	0·07	0·26	1·04	2·48	0·70	4·03
Nambour	7·54	13·50	5·38	3·58	6·65	4·79	1·36	0·05	0·83	1·62	4·70	0·85	5·37
Nerang	3·85	4·95	4·99	5·61	8·98	3·63	0·61	0·27	1·55	1·04	4·59	2·21	5·14
Roma	1·76	2·65	1·74	1·44	2·92	1·72	0·21	0·35	0·31	0·15	1·02	2·15	2·62
Stanthorpe	5·00	3·04	0·37	5·29	2·64	1·63	1·01	0·63	1·77	0·28	3·48	1·94	4·43
Tambo	3·90	3·54	1·34	2·54	5·12	0·12	0·06	0·36	0·46	Nil	0·85	1·57	0·39
Taroom	2·92	3·25	1·63	2·73	6·17	2·22	0·33	0·67	0·31	Nil	0·76	1·11	2·52
Tewantin	7·61	11·79	2·91	3·64	12·43	10·01	2·06	0·22	0·55	1·29	6·57	1·28	6·64
Texas	2·97	3·77	0·09	2·47	3·78	3·07	0·80	0·53	1·09	0·16	3·54	0·94	4·54
Toowoomba	2·75	4·50	1·91	4·17	5·27	3·69	0·65	1·01	0·66	0·61	2·59	2·09	3·20
Warwick	3·65	1·52	1·28	6·20	2·06	2·18	0·77	0·26	1·01	0·41	4·00	2·16	3·98
Westbrook	3·65	2·46	0·57	2·00	1·24	2·54	0·46	0·71	0·61	1·23	2·60	3·62	2·39

* Return not received. Figures approximate only.

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Victorian, finest (salted and unsalted), 112s. and 114s.; good to fine, 104s. and 108s.; New South Wales, finest (salted), 110s., 112s., 114s.; unsalted, 112s.; secondary, 98s. and 106s. Queensland, finest, 110s. and 112s.; good to fine, 100s. and 106s. per cwt. Towards the end of the month there was a fall of 6s. per cwt. for all butters in the London market.

CHEESE.—Canadian, 62s. to 65s.; New Zealand, 61s. to 63s. per cwt.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £17 to £18; raw, £14 to £18 per ton; German beet, 88 per cent., 10s. 3d. per cwt.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—5s. to 9s. per cwt.

Rice.—Real Carolina, £24 to £28; Rangoon, £9 to £12; Japan, £13 to £17 10s.; Java, £17 to £20; Patna, £15 to £17 per ton.

Coffee (in bond, duty $1\frac{1}{2}$d. per lb. and $\frac{1}{4}$ per cent.).—Ceylon plantation, 50s. to 125s.; peaberry, 50s. to 105s.; Santos, 40s. to 57s.; Jamaica, 110s. to 130s. per cwt.

Chicory Root, Dried (duty paid).—24s. to 25s. per cwt.

Arrowroot.—St. Vincent, $1\frac{3}{4}$d. to $3\frac{1}{2}$d.; Natal, 3d. to $4\frac{1}{2}$d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

Wheat.—Duluth, 34s. 3d. to 34s. 6d. per 496 lb.; English, 30s. 4d. to 32s. 2d. per 504 lb.; Australian, 32s. to 34s. 6d. per 480 lb.

Flour.—Australian, 26s. per 280 lb.

Malting Barley.—28s. to 34s. per 448 lb.; grinding, 18s. 9d. to 26s. per 416 lb.

Oats.—New Zealand, 17s. to 17s. 6d.

Split Peas.—40s. to 50s. per 504 lb.

Ginger.—Jamaica, 42s. to 70s.; Cochin, 42s. to 70s.; Japan, 18s. to 18s. 6d. per cwt.

Vanilla.—3s. 9d. to 7s. 6d., 7 to $7\frac{1}{2}$ in.

Pepper.—Capsicums, 14s. to 60s.; chillies, 33s. to 37s. per cwt.; black, $5\frac{1}{2}$d.; white, 8d. per lb.

Rubber.—3s. 10d. to 5s. 4d.; Ceylon "biscuits," 6s. 4d. per lb.

Green Fruit.—Apples: Australian, no quotation; American, 20s. to 32s.; Canadian, 17s. to 21s. 1d. per case; bananas, per bunch, 6s. to 10s.; pineapples, 2s. to 5s. each. Oranges, Valencia, per 420, common, 10s. to 11s.; medium, 13s. to 14s.; fine selected, 14s. to 16s.; finest selected, 16s. to 22s. Lemons, Naples, per 360, ordinary to fine, 16s. to 22s.; finest selected, 36s. to 40s. Grapes, 10s. to 26s. per barrel.

Dates.—Tafilat, 71s. to 75s.; Persian, 10s. to 12s.

Cotton.—Uplands, $6\frac{1}{2}$d. to 7d.; Sea Island, $15\frac{1}{2}$d. to 16d. per lb.

Cotton Seed.—£5 to £5 10s. per ton.

Cotton-seed Oil.—Crude, £15 10s.; refined, £16 to £18 10s. per ton.

Cotton-seed Oil Cake.—£4 17s. 6d. to £4 18s. 6d.

Cotton Waste.—In 5-cwt. bag bales, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

Linseed.—40s. per qr.

Linseed Oil.—£17 12s. 6d. to £17 15s. per ton.

Linseed Oil Cake.—£7 10s. to £8 2s. 6d. per ton.

Olive Oil.—£37 to £41 per tun (252 gallons).

Copra (cocoanut-kernel).—£16 10s. to £17 per ton; £11 to £11 2s. 6d. at the S.S. Island trading stations. Corresponding value in Queensland, £12 to £14 per ton.

Cocoanut Oil.—£28 10s. to £34 per ton.

Beeswax.—Australian, £7 to £7 10s. per cwt.

Lucerne Seed.—60s. to 68s. per cwt.

Canary Seed.—66s. to 80s. per quarter of 480 lb. = 8s. 3d. to 10s. per bushel.

Honey.—17s. to 26s. 6d. per cwt.

Manila Hemp.—£50 10s.

Sisal Hemp.—£39 8s.

New Zealand Hemp.—£31 10s.

Fourcroya (Mauritius Hemp).—£34 7s.

Sansivieria Hemp (African).—£21.

Divi Divi.—£6 10s. per ton.

Tapioca (duty, 5d. per cwt.).—$1\frac{1}{2}$d. to 2d. per lb.; pearl, 12s. to 18s. per cwt.

Eggs.—French, 12s. to 15s. 6d.; Danish, 12s. to 16s. per 120.

Bacon.—Irish, 57s. to 66s.; American, 35s. to 54s.; Canadian, 56s. to 60s. per cwt.

Hams.—Irish, 86s. to 112s.; American, 48s. to 56s. per cwt.

TALLOW.—Mutton, fine, 33s. 6d,; medium, 27s. 6d,; beef, fine, 29s. 6d.; medium, 27s. per cwt.

POULTRY (Smithfield).—Good supplies, but only a moderate demand. Prices: Ducks, 2s. to 3s.; geese, 5s. to 6s.; Surrey fowls, 2s. 6d. to 3s. 6d.; Lincolnshire fowls, 2s. to 2s. 6d.; Essex fowls, 2s. to 2s. 9d.; Irish fowls, 1s. 9d. to 2s.; Russian fowls, 1s. 9d. each; English hares, 2s. 6d. to 3s.; leverets, 1s. 9d. to 2s.; Scottish hares, 1s. 4d. to 1s. 6d.; wild rabbits, 8d. to 11d. each; Australian rabbits, 6s. to 7s. 6d. per dozen.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	Jan. 13.	Jan. 20.
New Zealand Sheep. (Crossbred Wethers and Merino Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$4\frac{1}{4}$d.	$4\frac{1}{4}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{1}{4}$d.	$4\frac{1}{4}$d.
Canterbury, heavy (64 lb. to 72 lb.)	4d.	4d.
Dunedin and Southland (56 lb. to 64 lb.)	None offering.	
North Island (56 lb. to 65 lb.), ordinary	$3\frac{15}{16}$d.	$3\frac{7}{8}$d.
North Island, best	$4\frac{1}{16}$d.	4d.
Australian Sheep. (Crossbred and Merino Ewes.)		
Heavy (over 50 lb.)	$2\frac{7}{8}$d.	$2\frac{13}{16}$d.
Light (under 50 lb.)	$3\frac{1}{8}$d.	3d.
River Plate Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{1}{8}$d.	$2\frac{7}{8}$d.
Light (under 50 lb.)	$3\frac{1}{4}$d.	3d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	$4\frac{1}{2}$d.	$4\frac{3}{8}$d.
Canterbury, heavy (36 lb. to 42 lb.)	$4\frac{1}{2}$d.	$4\frac{3}{8}$d.
Dunedin and Southland (28 lb. to 42 lb.)	—	$4\frac{1}{16}$d.
North Island (28 lb. to 42 lb.) ...	None offering.	
Australian Lambs.		
30 lb. to 40 lb., first quality ...	$4\frac{3}{8}$d.	$4\frac{1}{4}$d.
30 lb. to 40 lb., second quality ...	$3\frac{3}{4}$d.	$3\frac{3}{4}$d.
River Plate Lambs.		
30 lb. to 40 lb.	None offering.	
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{7}{8}$d.	$2\frac{5}{8}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{3}{8}$d.	3d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{5}{8}$d.	$2\frac{5}{8}$d.
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{1}{2}$d.	$2\frac{3}{8}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{5}{8}$d.	$2\frac{5}{8}$d.

QUEENSLAND TIMBER.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the English market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand. Ivory wood should be carefully preserved from destruction.

General Notes.

AN ARTIFICIAL MUSHROOM BED.

Mushrooms may easily be grown in boxes or even in pots. Make a box 3 feet long, 18 inches broad, and 7 inches in depth. Let the box be half-filled with horse dung from the stable, the fresher the better. If wet, dry it for two or three hours before putting it into the box. Beat it down hard. After the second or third day it will heat. Then take a spawn brick, which can be purchased at any seedsman's shop, and break it into thin pieces. Lay these 4 inches apart on the dung in the box. In about six days the spawn next the dung will have begun to run into it; then add 1½ inches more of dung, and beat it down firmly. In a fortnight the spawn will have run all through the dung; now put 2½ inches of mould on top, and beat it down firmly as before. In five or six weeks the mushrooms will begin to come up. Give a slight watering. The mushrooms will continue to be produced for six weeks or two months. They require neither light nor free air. Each box will yield from twelve to twenty-four quarts of button mushrooms. If the boxes are kept in a dark cellar, they will grow rapidly. If you cannot get any dung, take a little straw and lay it about 2 inches thick in the bottom of the box. Break the spawn brick into about ten pieces, and lay them close together on the straw. Cover them with 3½ inches of mould, well pressed down. Water them well, and in a month or five weeks the mushrooms will appear, provided that the condition of warmth, moisture, and darkness are observed.

CURE FOR SNAKE-BITE.

Many are the remedies for snake-bite which have been published, but although one or two of these have been successfully applied—for instance, permanganate of potash and the rubbing with vinegar—yet every now and then a death from this cause is reported, the reason most probably being that the victim was far from medical help. Bush dwellers as a rule are careless about snakes, and only kill them if they happen to find a stick handy. Probably none carry about them habitually any antidote. Here is a simple antidote which a child can carry in his pocket and use. We merely give it for what it is worth. If it does no good, it certainly can do no harm, and it is worth a trial. It comes from the "Valdosta Times," and is reprinted by the "Florida Agriculturist." The "Times" article detailed the suffering undergone by a Mr. H. Fender, who was recently bitten by a rattlesnake, and telling of the remedies he employed. The articles were reprinted in a number of State papers, and have served to bring to light numerous remedies for snake bites. One of the simplest and most vouched for is the alum treatment.

The Savannah Press states that the drinking of a strong solution of alum water is almost a sure cure, and a Savannah physician has sent the same paper a scrap book, in which the alum theory is more thoroughly developed.

The story is told in this article that something over thirty years ago a rattlesnake crawled out from under a Georgia farm house, and, instead of killing it, one of the party who detected the reptile asked permission to try an experiment. So he stepped out, pulled off his boot and sock, and kicked the reptile in the mouth with his naked foot. Of course the reptile bit him on the foot. The man went behind the house, swallowed something, and, returning, pulled off the other boot and sock and made the snake bite the other foot. Once more the wounded man retired behind the house, took something in his hand, came back, killed the snake, put on his boots, and resumed his seat among his astonished friends. The crowd, of course, begged him to tell them what he took when he went around the house. He said that when out on the Rocky Mountains, where there are a great many rattlesnakes, people carry alum

in their pockets, and as soon as bitten they break off and swallow a piece of alum the size of a nut. It will act as an antidote for the poison of the most venomous snake. That was what he took when the Georgia snake bit him, and hundreds of people in the south to whom this remedy has been given report a successful trial in snake-bite.

A man who hunted a great deal in the mountains of North Georgia always carried a pocket full of alum, and if one of his dogs was bitten by a rattlesnake he would pour alum down the dog's throat, and the animal would go on in the hunt. The theory of the action of the drug is that as soon as the alum reaches the stomach the bile gushes out of the bile tubes into the intestines, and no doubt regurgitates into the stomach, which is irritated by the presence of the alum.

This leads an Atlanta physician to say that a piece of alum the size of the finger, chewed and swallowed, seems to be a perfect cure for the most poisonous snake-bite.

Whether the above be true or not, it would be easy to carry a piece of alum in one's pocket, and, in case of a bite, the alum could be taken as a preliminary to seeking medical aid.

USEFUL RECIPES.

How to Make Commercial Candied Citron.—Cut the fruit into halves or quarters, according to its size, put it in a tub or cask of brine, having first cleaned out the pulp, and leave it for a month, then renew the salt water, and let the citron lie in it for four or five months, or as long as you choose; this long process is necessary to eliminate the bitter principle from the rind, which it is otherwise impossible to remove entirely.

Next boil the fruit in fresh water until a fork will easily pass through it; it usually takes about an hour and a-half to reach this point. Then put it in cold fresh water, to remain there for at least twenty-four hours, when it will have turned to that light-green colour which we have learned to associate with candied citron.

The next step is to drain the fruit, place it in earthen jars, and pour over it hot syrup of white sugar of 20 degrees sacchrometer; cover it entirely, and let it stand for three weeks, but the syrup must be poured off twice a week, boiled, skimmed, and more sugar added each time until the syrup is a little thicker than it was at the first boiling; turn it back over the fruit at boiling point. The three weeks elapsed, put the citron in a vessel containing the syrup, with all the sugar it can dissolve; let it boil for ten minutes, and then for twenty-four hours keep it near the boiling point without letting it reach it, then boil it again until no more sugar can be taken up.

The proportion of sugar absorbed in this process is about 80 lb. to 100 of citron rinds. The boiling completed, the rinds are spread on wire-netting and dried, either in the sun, or, which is a far superior method, in an evaporator.

Citron Peel.—Cut citron in half and put same in brine strong enough to float an egg for ten days, and then take pips out and soak in fresh water for eighteen days, changing water every three days, and do same in thick syrup for same amount of days.

Banana Vinegar.—Peel the ripe bananas and place them in a jar or large vessel. Pour off the juice each day as it accumulates until there is only the coarse spongy *débris* left. Strain the juice through a thick bit of brown calico (the calico must be washed first), and let it stand until turned to vinegar. The vessel that holds the juice should not be corked, but have a piece of thin muslin tied over its mouth, to let the air in and to keep insects out, &c. The time for the juice to become good vinegar depends on the condition of the bananas used. Indifferent fruit makes poor vinegar. A common way to make banana or mango vinegar is to fill a corn bag with the ripe fruit and hang it over a wooden tub to collect the juice, but the flavour of the vinegar is not so good as if a jar or enamelled vessel were used.

Answers to Correspondents.

PENICILLARIA.

W. MEWES, Emu Vale.—

1. This plant is not allied to the amber cane, the latter being a sorghum.
2. When the plant is cut or eaten down when in rank growth and wet, it is very likely to blow, if not to poison, stock. Opinions differ as to its being a good fodder plant. Mr. F. M. Bailey, Government Botanist, does not place much value on it for feeding stock. It is known now by the names Egyptian millet, East Indian millet, Cat's-tail or bulrush, and pearl millet.

Times of Sunrise and Sunset, 1906.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·58	6·46	5·22	6·42	5·42	6·19	5·59	5·46
2	4·58	6·46	5·22	6·42	5·43	6·18	5·59	5·45
3	4·59	6·46	5·23	6·41	5·43	6·17	6·0	5·44
4	5·0	6·46	5·24	6·41	5·44	6·16	6·0	5·43
5	5·1	6·47	5·24	6·40	5·44	6·15	6·0	5·42
6	5·2	6·47	5·25	6·40	5·45	6·14	6·1	5·41
7	5·2	6·47	5·26	6·39	5·45	6·13	6·1	5·40
8	5·3	6·47	5·27	6·38	5·46	6·12	6·2	5·39
9	5·3	6·47	5·28	6·37	5·46	6·11	6·2	5·38
10	5·4	6·48	5·28	6·36	5·47	6·10	6·3	5·37
11	5·4	6·48	5·29	6·35	5·47	6·8	6·3	5·36
12	5·5	6·47	5·30	6·35	5·48	6·7	6·4	5·35
13	5·6	6·47	5·31	6·34	5·49	6·6	6·4	5·34
14	5·7	6·47	5·32	6·34	5·50	6·5	6·5	5·33
15	5·8	6·47	5·32	6·33	5·50	6·4	6·5	5·32
16	5·9	6·46	5·33	6·32	5·51	6·3	6·6	5·31
17	5·10	6·46	5·34	6·31	5·51	6·2	6·6	5·30
18	5·11	6·46	5·34	6·30	5·52	6·1	6·7	5·29
19	5·11	6·46	5·35	6·29	5·52	6·0	6·7	5·28
20	5·12	6·46	5·36	6·28	5·53	5·58	6·8	5·27
21	5·12	6·46	5·36	6·27	5·53	5·57	6·8	5·26
22	5·13	6·46	5·37	6·26	5·54	5·56	6·9	5·25
23	5·14	6·45	5·38	6·25	5·54	5·55	6·9	5·24
24	5·15	6·45	5·39	6·24	5·55	5·54	6·10	5·23
25	5·16	6·44	5·40	6·23	5·55	5·53	6·10	5·22
26	5·17	6·44	5·40	6·22	5·56	5·52	6·11	5·21
27	5·18	6·44	5·41	6·21	5·56	5·51	6·11	5·20
28	5·19	6·43	5·41	6·20	5·57	5·50	6·12	5·19
29	5·20	6·43	...	...	5·57	5·49	6·13	5·18
30	5·20	6·42	...	...	5·58	5·48	6·13	5·17
31	5·21	6·42	...	...	5·58	5·47	...	...

PHASES OF THE MOON.

			H. M.
2 Jan.	☾	First Quarter	12 52 p.m.
10 „	○	Full Moon	2 36 „
17 „	☽	Last Quarter	6 48 „
24 „	●	New Moon	3 9 „
1 Feb.	☾	First Quarter	10 30 a.m.
9 „	○	Full Moon	5 45 „
16 „	☽	Last Quarter	2 22 „
23 „	●	New Moon	5 57 „
3 Mar.	☾	First Quarter	7 28 a.m.
10 „	○	Full Moon	6 17 p.m.
17 „	☽	Last Quarter	9 57 a.m.
24 „	●	New Moon	9 51 p.m.
2 April	☾	First Quarter	2 2 a.m.
9 „	○	Full Moon	4 12 „
15 „	☽	Last Quarter	6 36 p.m.
23 „	●	New Moon	2 6 „

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1906.		ROCKHAMPTON.		TOWNSVILLE.		COOKTOWN.	
		Rise.	Set.	Rise.	Set.	Rise.	Set.
January	...	18 m.	2 m.	42 m.	12 m.	53 m.	9 m.
February	...	15 m.	5 m.	36 m.	18 m.	44 m.	18 m.
March	1 to 20...	11 m.	9 m.	29 m.	25 m.	35 m.	27 m.
„	21 to 31...	9 m.	11 m.	28 m.	26 m.	29 m.	33 m.
April	...	7 m.	13 m.	20 m.	34 m.	21 m.	41 m.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JANUARY. Prices.
Apples, Eating, per packer	6s. 6d. to 11s.
Apples, American, per packer	16s.
Apples, Cooking, per packer	5s. to 8s. 6d.
Apples, Local, per packer	3s. to 4s. 6d.
Apricots, quarter-case	2s. 6d. to 3s. 6d.
Bananas, per bunch	6d. to 1s. 3d.
Bananas, per dozen	2d.
Cherries, quarter-case	2s. 6d. to 7s. 6d.
Comquats, case	...
Lemons, per case	3s. to 4s. 6d.
Mangoes, half-case	2s. 6d. to 5s.
Oranges, per packer	6s. to 11s.
Passion Fruit, quarter-case	1s. 6d. to 2s. 6d.
Papaw Apples, per case	3s.
Peaches, half gin case	1s. 6d. to 3s. 6d.
Peanuts, per lb.	3d.
Pineapples (rough leaf), per dozen	10d. to 3s. 6d.
Pineapples (smooth leaf), per dozen	2s. to 5s.
Plums, Imported, quarter-case	4s. 6d. to 5s.
Plums, Local, quarter-case	1s. to 3s. 6d.
Strawberries, per quart	4d. to 6d.
Tomatoes, quarter-case	6d. to 1s. 6d.
Watermelons, per dozen	2s. to 4s.
Rockmelons, per dozen	9d. to 2s.
SOUTHERN FRUIT MARKET.	
Bananas, Queensland, per case	6s. 6d. to 7s. 6d.
,, ,, per bunch	1s. to 3s.
Lemons, per half-case	6s. to 10s.
Oranges, per double case	15s. to 17s.
,, Washington Navels, per double case	16s. to 17s.
Pineapples, case	2s. to 8s.
Rockmelons, case	2s. 6d. to 3s.
Peaches, half-case	2s. to 4s. 6d.
Tomatoes, quarter-case	1s. 9d. to 2s.

SISAL AGAVE IN FOREST LAND.

JOHN SMITH, Proserpine.—

1. The land need not be stumped, but the trees should be felled and burnt off, for two reasons: One is, that the sisal plants require all the sun heat they can get. Shade is detrimental to fibre production. The other reason is, that dead limbs from standing timber are constantly falling, and would damage the plants.
2. The leaves are not soaked; they are put straight from the field through the machine. They should be scutched within twenty-four hours of being cut.
3. Soaking would not prevent waste, but it would certainly discolour the fibre, and so reduce its value.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JANUARY.

Article.		JANUARY. Prices.
Bacon (Pineapple)	lb.	7d. to $8\frac{1}{2}$d.
Barley, Malting	bush.	2s. 9d.
Bran	ton	£5
Butter, Factory	lb.	$11\frac{1}{4}$d. to $11\frac{1}{2}$d.
Chaff, Mixed	ton	£3 12s. 6d.
Chaff, Oaten	"	£4 2s. 6d. to £4 7s. 6d.
Chaff, Lucerne	"	£3 to £3 10s.
Chaff, Wheaten	"	£3.
Cheese	lb.	$5\frac{1}{2}$d. to 7d.
Flour	ton	£8 5s.
Hay, Oaten	"	£5 2s. 6d. to £6
Hay, Lucerne	"	£1 15s. to £2.
Honey	lb.	$1\frac{1}{2}$d. to 2d.
Maize	bush.	5s. to 5s. 1d.
Oats	"	2s. 9d. to 3s. 8d.
Pollard	ton	£5 5s.
Potatoes	"	£8 to £12 15s.
Potatoes, Sweet	"	...
Pumpkins	"	...
Wheat, Milling	bush.	3s. 11d.
Wheat, Chick	"	3s. 6d. to 3s. 10d.
Onions	ton	£3 15s. to £4 5s.
Hams	lb.	9d. to $10\frac{1}{2}$d.
Eggs	doz.	5d. to 8d.
Fowls	pair	2s. 3d. to 3s. 4d.
Geese	"	4s. to 5s. 6d.
Ducks, English	"	2s. to 4s.
Ducks, Muscovy	"	3s. to 4s.
Turkeys, Hens	"	6s. 6d. to 7s.
Turkeys, Gobblers	"	14s. 6d to 18s.

THE DATE PALM IN THE WEST.

ARAB, Rockhampton.—

1. The so-called desert country west of Rockhampton is ideal country country for date-growing. Why not take a run to Barcaldine? You would then see how the date palm thrives.
2. The amount of annual rainfall required for the best dates is from 5 to 10 inches. *See* articles on the date palm in Queensland in this Journal, Vol. VIII., Feb., 1901; Vol. XII., May, 1903.

LENGTH OF ROPE REQUIRED TO TETHER A COW.

DAIRYMAN, Graymare—

Your question is similar to one propounded in the issue of the "Farmers' Union Advocate," N.Z., of 13th January. To enable a cow to graze over no more and no less than 1 acre, the field must be circular or semi-circular. An acre is 4,840 square yards. Divide this by 3·1416, the quotient is 1,540·61.

The square root of the quotient is 39·25 yards, which is the radius or distance from the centre to the circumference of the circle. The tether rope will be of the same length, and the cow tethered in the centre of the field will have exactly an acre of grass within reach.

Orchard Notes for March.

By ALBERT H. BENSON.

By the end of February the marketing of deciduous fruits is practically finished in Queensland, as, with the exception of a few varieties of late apples in the Stanthorpe district, and of persimmons in the various parts of the State, this season is over.

The finish of the deciduous fruits, however, marks the commencement of the citrus season, and these fruits will be ready for handling in the earlier districts of the State during the month. This being the case, I take this opportunity of calling the attention of all citrus-growers to the following very important considerations:—

FIRST: *The necessity for preventing this fruit from being destroyed by pests.*

In addition to the various scale insects attacking citrus trees and citrus fruits, the ripening fruit is liable to be destroyed by insects that either suck the fruit, such as the orange-piercing moths described by Mr. Tryon in the April number of this Journal for 1898; or by insects boring into the fruit, such as the yellow pearl moth, sometimes known as the corn moth or borer moth, and the fruit fly. In order to obtain a good crop of marketable citrus fruit, these three pests must be carefully looked after, and every possible means must be taken to keep them in check so as to reduce the damage caused by them as much as possible. The orange-piercing moths can be destroyed in large numbers by the use of poisoned baits consisting of well-ripened Cavendish bananas impregnated with a solution of arsenite of soda, or a soluble arsenical poison, such as the well-known white-ant exterminators. These poisoned baits should be hung up among the orange-trees, and they will attract and destroy large numbers of the moths. Ripe Cavendish bananas, unpoisoned, also act as an attraction to the moths, and they may be caught by means of an ordinary butterfly-net when sucking the fruit at night. The yellow peach moth, the second of these pests, is much more difficult to deal with, as it is not easily attracted or captured. It lays an egg on the skin of the fruit, usually where two fruits touch, or else in the folds of the skin, near the stem—in fact, in positions where it is not likely to be rubbed off. The egg hatches out into a minute caterpillar, which eats its way into the fruit, and increases in size till it is fully an inch long. Green fruits attacked by this insect rapidly turn yellow, and usually fall off, the loss in some instances being considerable, as the pierced fruit is useless, and rots rapidly. There are two remedies—first, the destruction of the young caterpillar as soon as it has hatched from the egg and before it has eaten its way into the fruit, and the second remedy is by the gathering and destruction of all fruits and seeds harbouring either the larvæ or pupæ of the insect. The destruction of the young larvæ or caterpillar is accomplished by spraying the infected trees with Paris green or arsenate of lime, as described in the October number of this Journal for 1900, under the article on citrus culture. The arsenical spray must be put on in the finest possible form so as to completely cover all the fruit on the tree, so that when the young caterpillar starts to eat the skin of the fruit, it will eat a minute quantity of arsenic and be poisoned. This remedy has proved very effectual in the treatment of the codling moth which attacks pomaceous fruits, and there is no reason why it should not be equally efficacious in the case of this insect as well. One spraying will not be sufficient, as the moths continue to lay their eggs for a considerable time, so

that in districts where this moth is especially destructive to citrous fruits, spraying should be repeated at intervals of not less than three weeks.

The last and by far and away the most destructive insect is the fruit fly. It attacks the orange whilst still quite green, and although the eggs seldom hatch out when laid in the unripe fruit, the injury to the latter caused by the puncture of the ovipositor of the fly tends to a premature ripening of the fruit and to its falling from the tree. Kumquats are especially liable to be attacked by the fly, and often form a very good trap for it, as if the tree is carefully watched and all infested fruit is gathered and destroyed, a large number of larvæ which would otherwise hatch out and destroy a quantity of fruit, would be prevented from so doing. As stated over and over again in these notes and in the articles on fruit culture appearing in this Journal, there is no better remedy for the fruit fly than the destruction of infested fruit, and the removal from the citrus orchard of all worthless and unprofitable fruit trees of all kinds which tend to harbour and breed these insects. Systematic and combined effort on the part of all fruitgrowers to carry out these recommendations will do more to keep this pest in check than anything else, and surely the citrus industry alone is worth taking a little trouble to save, as the quality of the fruit is recognised throughout Australia, and, it is to be hoped, will be shortly recognised in the home markets as well.

SECOND.—The Peacock or Shoobridge case, which was accepted as the standard case at the Brisbane Fruitgrowers' Conference in 1897, and again at the Melbourne Conference in 1900, for all hard fruits, should be the only case used in which to market the fruit; as it is the only case at present in use in Australia in which it is possible to pack every grade of oranges, so as to have the fruit of even size throughout, and to have the case properly filled. Fruit, packed in this case, carried well to Vancouver, and no difficulty was experienced in packing the various sized fruits.

Strawberry planting can be continued during the month on same lines as recommended in the notes for February.

Where new orchards are to be planted, it is fully time to see about the preparation of the land, if this has not already been done, as it is advisable to get the land well sweetened before planting. Old worn-out trees, and inferior trees that it is desirable to do away with, can be taken out during the month, the holes from which they have been taken being left exposed to the action of the air, so as to be thoroughly sweetened by the time a fresh tree is planted in the same place. Keep the soil well worked, and where weeds have got the upper hand during the previous month mow them down, and turn them under with the plough, a plough having a short digging mouldboard being the best for this purpose.

Farm and Garden Notes for March.

FARM.—Take every opportunity of turning up the ground in readiness for sowing and planting. The main crop of potatoes should be at once planted. As the growth of weeds will be slackening off, lucerne may be sown on deeply-cultivated soil. The latter should be rich and friable, with a porous subsoil, and should be thoroughly pulverised. Do not waste time and money in trying to grow lucerne on land with a stiff clay subsoil. The land for lucerne should be prepared a couple of months before sowing, care being taken to cross-plough and harrow before the weeds have gone to seed. This ensures a clean field. Sow either broadcast or in drills. In the former case, 20 lb. of seed per acre will be required; in the latter, 10 lb. A good stand of lucerne has been

obtained with less quantities. Lucerne seed is worth from £2 16s. to £3 5s. per cwt. in the British market. Should weeds make their appearance before the plants have sent down their taproots, mow the field. Before they can again make headway enough to do damage, the lucerne will be strong enough to hold its own against them. Harrow and roll the land after mowing. Gather all ripe corn. It is too late to sow maize, even 90-day, with any certainty of harvesting a crop of grain. Rye-grass, prairie-grass, oats, barley (in some districts, wheat), sorghum, vetches, carrots, mangolds, and swede turnips may be sown. In Northern Queensland, sow tobacco seed, cowpea, Carob beans, sweet potatoes, opium poppy, &c. Sow anatto, jack fruit, and plant kola-nut cuttings. Some temperate zone vegetables may be planted, such as egg plants, potatoes, &c. Coffee-planting may be continued. Harvest kafir corn and paddy.

KITCHEN GARDEN.—During this month a very large variety of vegetable seeds may be sown in readiness for planting out, where necessary, in the autumn, which begins on the 20th March. All unoccupied land should be roughly dug, and where required, add well-decomposed manure. Transplant cabbage, cauliflower, celery, &c. Sow French beans, beet, carrot, turnips, radish, cabbage, cauliflower, cress, peas, mustard, &c. Former sowings should be thinned out and kept clear of weeds. Mulch round melon and cucumber beds with a good dressing of long stable manure, as it assists in keeping the fruit clean and free from damp. Cucumbers, melons, French beans, and tomatoes should be looked for every day, and gathered, whether required or not, for if left on the vines to perfect their seeds, the plants will soon cease to be productive, or will form ill-shaped, inferior, unsaleable fruit.

FLOWER GARDEN.—Now is the time to plant out bulbs. A complete garden could be furnished with these charming plants, which are to be had in every colour and variety. Amongst the many are:—Amaryllis, anemone, arum, babiana, crinum, crocus, freesia, ranunculus, jonquils, iris, ixias, gladiolus, narcissus, Jacobean lilies, tigridia, tritonia. All bulbs like well-drained, somewhat sandy soil, with a plentiful admixture of leaf-mould. Herbaceous plants and annuals, which it is intended to raise from seed, should be sown this month. Such are antirrhinums (snap-dragon), asters, cornflowers, dianthus, larkspurs, daisies, cosmia, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas. Cannas now planted will require plenty of food in the shape of liquid manure. Put in cuttings of carnations. Chrysanthemums require attention in the way of disbudding, staking, watering with liquid manure, &c. Growers for exhibition will thin out to a few buds and protect the flowers from rain and sun. Dahlias should be looking well. To secure fine bloom, disbudding should be done. Now, as to climbers which may now be planted. These are:—Allamanda Schotii (beautiful yellow), Antigonon leptopus, a charming cerise-coloured climber; Aristolochia elegans, handsome as an orchid and easily grown; Aristolochia ornithocephala (Dutchman's pipe), very curious, large, always attracts attention; Asparagus plumosa, grows in any shady place; Beaumontia grandiflora, splendid white flower, grand for a fence, will grow 50 feet high; Bignonias of several kinds; Bougainvilleas, with their splendid leafy pink and purple flowers, rapidly clothe a fence or unsightly shed with a blaze of blossom; Quisqualis indica, a fine creeper, flowers pink, changing to white; Wistaria, purple and white. Most beautiful is the Bauhinia scandens, rarely seen about Brisbane, not even in the Botanical Gardens. We grew a plant of this climber at Eton School, Nundah, and it soon closed in the front of the veranda for a distance of over 80 feet. The leaves are very small, and in the flowering season it presents almost a solid mass of beautiful round bunches of blossom, something like the hawthorn bloom—pink and white. It seeds freely, but the seeds are difficult to germinate, and when they have produced a plant, it is still more difficult to rear it. A rooted sucker from the main stem will in all probability grow.

Agriculture.

NATIVE GRASSES AT STATE FARM, HERMITAGE.

By ALEXANDER MARTIN, Manager, Hermitage State Farm.

It is generally becoming understood by all persons interested in agricultural and pastoral pursuits in this State that something in the way of systematic cultivation or conservation must be undertaken ere long to keep up the supply of some of our best and most valuable grasses as fodder for dairy farm and station stock. Droughts and overstocking of pasturages have had a deteriorating effect upon the growth of our natural grasses and forage plants during the past, and in their place we often find a growth of useless weeds spring up which stock do not relish.

If this State intends to hold her own in the production of good wool and butter, and also in the matter of the frozen meat export trade, it becomes of vital importance to our agriculturists that more attention should be paid to our pastures than has hitherto been the case. That we have far more valuable native grasses in this country than any yet introduced has been demonstrated more than once.

In many trials to test the true qualifications of Australian grasses by comparison with exotic varieties we find that our native plants have yielded more forage and withstood drought much better than foreign ones, and if some of the money which has been sent out of the country in order to import exotic grass seeds (which often prove a failure under our severe climatic conditions) had been expended on the cultivation or even systematic conservation of our native grasses and other fodder plants, we should very likely not hear of thousands of cattle and sheep dying of starvation every recurring drought.

Respecting our native grasses and their seed, there is no doubt we are neglecting our opportunities in failing to develop what would be a great national asset.

In many districts the droughts have been so severe that but few grasses have remained alive. These few, although apparently dead, were enabled to withstand the dry weather by remaining dormant after having laid by a reserve of plant food in their root systems, and only needed the rain to enable them to spring into almost instantaneous growth. Many varieties rely upon the seeds retained by the soil from past seasons for their future existence.

The climatic conditions of our arid Western country only allow of the survival of varieties which can adapt themselves to their unwelcome surroundings, and it is from this and similar regions that our greatest drought-resisters are obtained.

It is most important that such grasses should be more generally cultivated on account of our Queensland summers being more or less droughty. Amongst the many lessons taught by past droughts this has been emphasised.

In order to combat the effect of our dry seasons it would be advisable to lay down our pasture with mixtures of native grasses and fodders of good value and of sufficient drought resistance to withstand a reasonable summer.

For this purpose many of the indigenous grasses are admirably adapted, but, unfortunately, seed is not at present available in sufficient quantity, and it is most important that more vigorous action should be taken to bring these valuable grasses into more common cultivation. In arid districts where rainfall is often badly distributed the best of the native grasses, owing to their speedy development, have the advantage over ordinary cultivated crops, and are often fit to cut for hay six or eight weeks after a heavy downpour.

Such grasses allow of the conservation of large quantities of grass hay, which could be profitably held over for unfavourable seasons. The special

value attached to the grasses of our dry districts is in the fact that they are acclimatised, and in every way fitted for the task they have to fulfil.

For general stock-feeding purposes on a large scale we still have to rely mainly upon our native grasses, and probably this will always be the case where irrigation is impracticable. Experience has taught us that our natural grasses on large areas are not improving, but, on the contrary, degenerating.

The bare condition to which much of the surface soil is reduced during lengthened periods of dry weather gives favourable opportunities for seeding with suitable grasses even in a small way, without the necessity for all the ordinary processes of cultivation.

After the favourable early summer we have had, the natural grasses will produce (unless in places where they have been too closely fed down) an abundance of seed, and there should be no difficulty experienced by farmers in collecting any quantity from, say, railway reserves or specially reserved areas for dissemination over their pasturages.

The practice of laying down grass as a permanent pasture can hardly be said to have attained much importance in Australia, but on a few large holdings extensive areas have from time to time been laid down with the express purpose of forming permanent pasturage.

The results obtained have in most cases been satisfactory, but more benefits would be derived from the planting of indigenous grasses in preference to introduced varieties which are not so thoroughly acclimatised. Amongst the best of our native grasses may be mentioned the Andropogons, Panicums, Astreblas, Eragrostis, and Danthonias.

Some time ago a number of promising varieties of indigenous grasses were planted out in small quantities at the Hermitage State Farm (mostly Western district species), in order to observe their behaviour under the climatic and soil conditions of downs country.

No attempt was made to modify climatic conditions by watering or irrigation, nor has any cultivation been applied (with the exception of eliminating weeds from the drills) which might tend to envigor the natural growth of the plants.

Amongst the most healthy and vigorous grasses under these conditions are the Panicums, Andropogons (blue grasses), and Anthistirias. Most of these grasses are easiest propagated by division of the roots.

The grasses under observation have just come through a very severe and trying spring as far as rainfall was concerned. They were planted out in tufts during May and June, and the rainfall since planting has been as follows:—

June	·67	October	3·80
July	·25	November	1·45
August	·87	December	3·50
September	·34	January	1·73

Despite the adverse weather during spring, some of the grasses grew vigorously throughout.

Appended are a few notes on the growth of the grasses under observation:—

Panicum divaricatissimum (Umbrella Grass).—Growing very strongly and vigorously. All the Panicums contribute largely to the valuable native grasses, and they are well worth of attention. They make good fodder, are hardy, and produce a large quantity of herbage suitable for hay-making. Produces seed abundantly, which is easily separated from the panicle. Height, about 2 feet 6 inches. Roots tough and fibrous, penetrating deeply into the soil.

Panicum decompositum (Australian Millet).—Growing very luxuriantly, 4 feet 6 inches high. A prolific and dense grower. Rather more coarse than the other Panicums, but would make good hay.

Panicum trachyrrhachis (Coolibar Grass).—Growing strongly, from 3 to 4 feet in height. Does well on open downs country and on rich soils. Yields a large amount of herbage during summer. A prolific seed-bearer.

Panicum gracile (Slender Panick Grass).—Growing strongly and vigorously. Rather more dwarfed than the other Panicums. Not so prolific in seed-bearing, but is a good pasture grass.

Panicum leucophæum.—Did not do so well as the other Panicums, but is a good grass for pasturages under more favourable conditions.

Andropogon erianthoides (Satin Heads).—Growing very strongly and vigorously to a height of 5 feet. Roots deeply in the soil, which enables it to withstand drought. Produces an abundance of rich, succulent herbage, and seeds prolifically.

Andropogon sericeus (a Blue Grass).—Growing very strongly to a height of 3½ feet. A good permanent pasture and hay grass. Seeds abundantly.

Andropogon intermedius (a Blue Grass).—Growing strongly and vigorously to a height of 4 feet. Produces rather coarse herbage, but makes good hay.

Agropyrum scabrum (Wheat Grass).—Growing vigorously and luxuriantly. This grass came through the dry weather much better than the others, and was growing vigorously all through the spring. Very valuable as a drought-resister. Height, 4 feet. Stooled out very densely, and produces rich and succulent herbage.

Chrysopogon parviflorus (Scented Golden Beard).—Strong and vigorous in growth. Height, 3 feet 6 inches. The flowers possess a peculiar fragrance on being crushed with the hands. Forms large tussocks, and produces rich herbage when young, but gets rather tough on maturing. Would make good ensilage.

Pappophorum nigricans (Black Heads).—Growing strong and vigorously to a height of 3 feet. A good drought-resister, yielding, in early summer, a fair amount of herbage. Produces an abundance of seed. A very ornamental grass.

Chloris truncata (Star or Windmill Grass).—A strong and vigorous grower. Height, 2 feet to 2 feet 6 inches. A good herbage, and makes excellent hay. Variable in habit according to class of soil.

Chloris ventricosa (Blue-star Grass).—Not doing too well. Variable as regards height and inflorescence. Does well on rich alluvial soils. Produces a fair amount of seed and succulent herbage under favourable conditions.

Anthistiria ciliata (Kangaroo Grass).—A very strong grower, of vigorous habit, attaining to a height of 7 feet. Stems rather coarse, and seed large. A fine deep-rooter, and producer of succulent fodder.

Eragrostis Brownii (Brown Love Grass).—Growing strongly and vigorously. Will grow all the year round, yielding rich herbage, and makes excellent hay. Strong, fibrous root system. A splendid pasture grass.

Sporobolus indicus (Parramatta or Tussock Grass).—A strong, vigorous grower, 5 feet high. When young it affords good herbage, but on maturing gets rather coarse and harsh. A prolific seed-bearer.

Sporobolus Lindleyi (Yak-ka-berry, native name).—A prolific seed-bearer. Used by the aboriginals as a food. Did not do well here. Not very well known outside the rich lands of the interior.

Ischæmum pectinatum (Comb-like Southern Grass).—A good pasture grass under favourable conditions. Not doing too well here.

Pollinia fulva (Sugar or Brown-top Grass).—A superior pasture grass in moist localities, but not doing too well here on account of the dry weather. Possesses a rich brown silky head, and is relished by stock on account of its sweet nature.

Eriochloa punctata (Early Spring Grass).—The tufts of this grass did not come up, as it was sown rather late, but it has the reputation of a good spring herbage producer.

Astrebla pectinata, v. curvifolia (Curly Mitchell Grass).—A good drought-resister and fattening grass. Did not do well here on account of late planting. Only one or two plants came to anything.

Chloris virgata (Rhodes Grass).—The seed of this species was planted too late to form observations.

BIGGENDEN STATE FARM.—REPORT ON ITS GRASSES.

The following is a report to the Department of Agriculture and Stock by the manager, Mr. D. Macpherson, on grasses growing on the Biggenden State Farm, January, 1906:—

The grasses on the farm may be divided into three sections:—1st: Those selected from some twenty varieties of grasses grown on the farm during previous year on account of their having given promise of being useful, particularly as winter feed. 2nd: Those that had not been grown on the farm before, or had been lost owing to adverse circumstances. 3rd: Those that have passed the small-plot stage, and have been distributed among the natural pastures by means of seed and roots.

All grasses in sections 1 and 2 were planted or sown in the early half of April in half-chain squares. I give the rainfall for the nine months following planting, to give an idea of the conditions under which the grasses grew:—

April	... 3·81	September ...	... 0·27
May	... 1·46	October ...	... 2·56
June	... 0·60	November ...	... 0·71
July	... 0·28	December ...	... 9·61
August ...	... 0·10		

The thermometer at the house repeatedly showed 2 degrees of frost, and in the low corner where these grasses grew it would probably be 2 degrees colder.

SECTION I.

Perennial rye, rough and smooth-stalked meadow, and prairie grasses were sown, but did not germinate.

Agrostis alba.—Was set out from roots. It kept green all through the winter, seeded in November and December. It is of very slow growth; would be a useful winter grass if seed will germinate in native pastures.

Rib Grass (*Plantago lanceolata*).—Set out from roots. Put out a good, soft, leafy growth during the winter months. Seeded freely in November and December. The plot was grazed (by means of tethering a beast on it) before the October rains, when there was about 6 inches of succulent feed on it. It should be useful for winter feed if seed will germinate in native pastures. It parches up in hot, dry weather.

Red Alsyke and Perennial Red Clovers.—From seed; germinated freely; gave a bite of feed through winter months, and were cut on the 30th December. The yield, however, was too small to take any account of. These may do better next year when better established. They flowered during November and December, and about 50 per cent. of the flower set seed.

White Clover.—From seed; germinated well; kept green during winter, but has never made any growth to speak of.

Sainfoin.—From seed; germinated well, but has never done any good.

Cocksfoot (*Dactylis glomerata*).—Germinated well, and kept green all through the winter months; made very little growth, and parched up during the hot, dry November weather.

SECTION II.

Phalaris commutata.—Planted from roots procured from Toowoomba Botanic Gardens. Made very satisfactory growth during dry winter months. During the heavy December rains this grass got silted over, and, whether from this or because of the heat, it has not done well since.

Sheeps Burnett.—Stood the winter well, growing 4 or 5 inches high before the October rains. Wilted off considerably during the hot, dry weather of November, but came again strongly with the December rains. Should be valuable in a pasture mixture.

Blue Grass (*Andropogon sericeus?*).—From seed; did not germinate until October, and then only a few seeds came through. Gives very little promise.

Flinders Grass (*Anthistiria membranacea*).—From seed; germinated fairly. Seeded freely during October, November, and December. Was dry during the winter months, but not sufficiently so to be unpalatable. It was never more than 9 inches high.

Mitchell Grass (*Astrebla curvifolia*).—From seed; did not germinate until October, and then only a few plants; grew about 18 inches high. Seeded December and January. Gives every promise of adapting itself to this district.

Rhodes Grass (*Chloris virgata*).—I received a ½-oz. packet of the seed of this grass; only a few seeds germinated, but by July each plant was sending out strong runners, and by the beginning of December it had taken entire possession of the ground allotted to it, which was half of a half-chain block. In early December sufficient plants to finish the half-chain block and also some to plant in the grass paddocks were obtained from the seedling plants. On the 30th December the plot was cut, the yield of cured hay being at the rate of 17 cwt. per acre. From appearances the block will be ready for cutting again in a few days. In the early stages of its growth this grass grows along the ground, and with the least moisture roots at every joint. When it has well covered the ground it grows erect to the height of about 2 feet 6 inches, and gives a beautiful dense sward of green succulent feed, as easy to mow as wheat or oats. (In this respect it has a great advantage over *Paspalum dilatatum*, which, with us, grows so tufty that the machine is always in danger of breaking when amongst it.) It requires somewhat more care in transplanting into the grass paddocks than either Paspalum or giant couch. A number of the plants I put out failed to strike, but those that have taken root have made good growth for the time. It transplants easily into cultivated ground. A comparison will give a better idea of the possibilities of this grass. Lucerne was cut on the same day, and gave only 7 cwt. of cured hay per acre, while Rhodes grass gave 17 cwt. Paspalum was nowhere more than 6 inches high. No other hay crop had sufficiently recovered from the dry winter and spring to be worth cutting.

SECTION III.

Giant Couch (*Panicum muticum*).—A good deal of this has been planted amongst the native grasses. It does not spread much, possibly because the stock are very fond of it. It grows very rapidly, and may be depended on for nine months out of the twelve, but with the last frost it burnt up to nothing, coming again as soon as the frosts are past, even in dry seasons like the last.

Russell River Grass (*Paspalum Galmarra*).—Spreads amongst the native pastures more readily than any of the other introduced grasses. It gives nice feed very quickly after rain, but burns up to nothing in either dry heat or cold.

Paspalum dilatatum.—Does not spread itself in the native pastures to any extent, but where planted holds its own. Does not keep its freshness, nor grow so quickly through the cold months as Rhodes grass. Half an acre in one of the grass paddocks was broken up, and sown with a mixture of 3 lb. Paspalum and 5 lb. cocksfoot in April, 1905. The plot was divided into three. Canary seed was sown on one, oats on the other, while the third had nothing but the grass seed. The canary seed and oats were cut for hay on the 21st October, the canary seed giving 1 ton of hay per acre, and the oats 25 cwt. The strike of Paspalum was much better on the canary seed plot than on the oats, and better on the oats than on the portion where no hay crop was taken; in fact, very little came there at all. Cocksfoot germinated all over the piece, but parched up during October and November.

SILAGE AND SILOS.

HINTS FOR FARMERS.

(Reprinted from the "Brisbane Courier.")

Through the courtesy of the Department of Agriculture and Stock, the following statement, specially prepared by Mr. H. C. Quodling, Agricultural Inspector, has been made available:—

The comparatively small section of producers who have assisted in placing the dairying industry in its present forward condition, are always face to face with a problem as to the best method of keeping up a regular supply of forage for their stock during the colder months, or when dry spells are experienced. Farmers in other countries have to face long, forbidding winters, when cattle and all stock have to be housed; but our chief trouble lies in the fact that there are times when a supply of succulent food is necessary, but often wanting. Many green fodder crops are raised for this purpose of supplementing pastures, but to be independent of the seasons and maintain stock in thriving condition, when prices should be at their best, there is no system more worthy of consideration than the making of silage. It is granted that an uncertainty exists till stack or pit is opened, and there is, particularly with stacks, a proportion of waste; but the disappointments are more often due to the primitive nature or provision for handling or pressing the material, coupled with the fact that the roughness of stacks admits air a certain distance from the outside, to the detriment of the resulting silage. Provided a certain amount of care is exercised, there is no reason to expect otherwise than that farmers who may begin in a primitive way will ere long be disposed to go in for conserving fodder with a regularity worthy of the result.

The nature of our climate, with its alternating fat and lean seasons, is sufficient evidence to prove that a grave necessity exists for popularising the system.

It is purposed to deal with some phases of the silage question, so that farmers who are disposed to give it a trial may have a few practical points for reference.

CROPS TO GROW.

Maize is regarded as one of the best all-round crops to grow, and is closely followed by sorghum. Whilst these constitute bulky and fairly nutritious fodder, there are many others, which, on account of the varying conditions met with in Queensland, and the means at the disposal of the individual farmer, will often regulate a choice. Kafir corn, Japanese, pearl, and other millets; barley, oats, rye, wheat, teosinte, cane tops, lucerne, tick beans, peas, vetches, clover grasses, &c., constitute a variety, but by no means a complete list of crops capable of being turned to good account.

Cowpeas and plants of the "Brassica" family are unsatisfactory to handle. When a more balanced food ration is sought for, combinations with leguminous crops may be made; in fact, maize, tick beans, and sunflower heads have been tried in combination in many places; whilst barley, with vetches or lucerne, makes nutritious silage.

HOW TO CUT.

For heavy and strong growing crops, sown in drills, the corn binder will prove the best machine, whilst an ordinary open-backed reaper and binder may be used for other lighter growing cereals. The essential feature is to have the fodder in handy bundles to economise labour. As machines are not always within reach for purchase or hire, other kinds may be substituted. A useful machine for one horse may be made by hinging two bevelled-shaped knives to a low portable platform, on which two seats are provided for operators, who collect the corn into bundles as the machine is drawn between rows.

Another home-made machine for one horse is made from a sledge to suit the width of rows, and may be fitted with a short length of scythe blade, projecting some 9 inches, at an angle of about 45 degrees. This cutter will fall

crop as fast as a horse will walk, but the chief disadvantage is that the stuff has to be collected and laid evenly into bundles, although a guide rod may be fitted so that the fodder when cut will be laid down in regular swathes.

For hand work, an ordinary cane knife answers the purpose well, or a makeshift can be made by rivetting the end of a scythe blade on to a handle.

When to Cut.

Fodder plants should be cut when they contain from 75 per cent. to 80 per cent. of moisture. Maize is at its best when in soft dough stage; sorghums and similar crops, when seed heads are formed. Other crops, notably lucerne, should be cut in flowering stage, whilst peas and tick beans when seeds have formed.

Kinds of Silage.

There are practically two kinds—sour and sweet—although certain modifications of temperature admit of subdividing these. Crops cut when immature, and at a time when there is a large percentage of water—up to 90 per cent.—develop more acidity in the silo, and temperatures do not run so high. On the other hand, more mature fodder, containing about 70 per cent. of moisture, develops less acidity and runs to higher temperatures. With high temperatures there is a greater loss of nutritive materials.

Sour.—In appearance should be of a pale-green colour, and should have a pleasant vinous aroma, with a slightly acid flavour. Dairymen favour this class for milk production. The controlling factors in making are as follow:—1. The crop requires to be cut when full of succulence, and is more often produced when just a little immature. 2. It must be carted and siloed directly after cutting. 3. Silo must be filled rapidly and thoroughly tramped all over. 4. The temperature must be kept at from 90 degrees Fahr. to 120 degrees Fahr., but the lower temperature is most in favour. To keep in the region of the nineties, quick filling and trampling must be resorted to, whilst above, from 100 degrees to 120 degrees Fahr., the filling may proceed each day. To lower temperature when filling, mass must be consolidated by trampling, and then add more silage. If full, and the temperature is rising, lay down some bagging and put on a layer of earth or handy weighting material, allowing it to remain.

Sweet.—In appearance should be of a nut to dark-brown colour, and have a rich, fruity, somewhat alcoholic aroma. The controlling factors in making are as follow:—1. The crop must be cut when succulent. 2. The process of filling must go on gradually, sufficiently so to allow temperature to rise. 3. The temperature may rise from 120 degrees Fahr. to 150 degrees Fahr. 4. Best results are obtained at temperatures ranging from 130 degrees Fahr. to 140 degrees Fahr. It is often necessary to fill on alternate days, or else arrange for crop to lie for a few hours or overnight in the field before carting in. Sweet silage may be made from wilted maize or sorghums, which have gone beyond the usual succulent period, but as temperatures usually run high it is necessary to apply pressure. In a sectional view of a stack the lower layers are of a pale-green colour, and may be classed as "sour"; this is accounted for by the exclusion of air, consequent upon weight of stuff above. As the temperature rises as higher layers are reached, silage gets darker in colour. At 160 degrees Fahr. it becomes almost black and "mow" burnt, and deteriorates in quality.

Chaffed and Whole Plant.

A feature in silage-making is to guard against the access of air, and prevent continuous combustion to the detriment of material. It is maintained that chaffed material cut in lengths from ⅝-inch to 1 inch, and put into a silo, is more satisfactory and economical than coarse, whole plants made into silage in a stack. Next to chaffed fodder, whole plants of cereals or legumes, which lie closely, and are capable of being tightly packed, and lastly coarse plants. For the latter there is always a strong reason for using pressure. Chaffed

fodder requires to be properly mixed in silo, and this process is facilitated by allowing elevator to discharge on to cone-shaped box.

APPLIANCES FOR HANDLING.

Cutters and elevators capable of dealing with 15 tons or more fodder per day are on the market. These are fitted with self-feeding attachment, delivering into rotary knives. Chaff fodder is conveyed into silo by means of elevator run by endless chain working over sprocket wheels or by an airblast. Most farmers are equipped with chaffcutter and gear, while many have small elevators; but it is to be expected that as this item may be the stumbling-block on account of its cost, there will be a greater tendency to go in for a modified class of silo, partly under and partly over ground, so that when cutter is rigged up on platform drays and wagons may draw up alongside. The chief concern in erecting a stack is the amount of labour involved in lifting bulky crops up as higher levels are reached. Should a large stack be made, it is necessary to have mechanical means at hand. By fitting up a mast and movable spar with pulleys and a wire rope, bundles of fodder can be raised with a horse. Stacks are sometimes located under a branch of a tree for rigging up a hoist.

PRESSURE.

When deep silos are made and chaff fodder used to fill them, it is not necessary to apply pressure or deadweight, as the bulk put in on each day or alternate days supplies all that is necessary. The exceptions are when siloing fairly mature fodder or when silos are shallow—say, 10 feet to 12 feet. There are several systems of pressure for dealing with stacks, the following being taken as examples:—(*a*) The intermittent, by mechanical means; (*b*) the regular, by means of deadweight.

(*a*) This class is known as the Johnson system, and has been universally adopted with satisfactory results. Strong foundation timber requires to be put in, and opposite pairs of ratchet drums placed on stout planks at regular intervals. Galvanised steel wire ropes are passed over stack, which, before pressing, is well "hearted" up. Pressure is exerted by one man using a handy lever, and as ropes are made taut a pawl drops into position in the ratchet and holds each grip. With this system, which is easy to manipulate, the temperature may be controlled. Like all these systems, when subsidence has to be followed up each day, they are ineffective if neglected. A farmer's press may be made somewhat on these lines by putting in a log framework and fitting up a series of Spanish windlasses made out of round timber, to work under or between ends of logs. Wire ropes are passed over stack at regular intervals.

(*b*) Regular pressure is obtained by means of deadweight, and the material used may be just what is the most handy for the individual. From a farmer's standpoint, a quantity of earth placed on top of sheets of bark or old iron is within reach of all. Compared with intermittent pressure, this system has certain advantages when once rigged up; but it must be borne in mind that, when building, temperature requires to be regulated by judicious stacking.

CONSTRUCTION OF SILOS.

Several important points require to be observed, and are as appended:—
1. The building must be airtight at floor, sides, and all doorways or chutes.
2. Sides must be plumb and smooth as possible, without any obstructions to settling of mass. Whether they are to be above or below ground is purely a matter for convenience and economy. They may be built of stone, brick, concrete, rubble, or wood, but in the case of material other than wood there should be an inside coating of cement wash or acid-proof dressing. For wood, the coating may be of tarred paper, ruberoid paint, tar by itself or mixed with resin, or a mixture of boiled linseed and black oil. As to shape, they are best made deep, with proportionate width, in order that pressure may be supplied by the weight of material. At the present time, when many farmers are going in

for silage in an inexpensive way, it is purposed to deal more particularly with wooden silos and plain makeshifts; but the parts exposed must be dressed with good weatherproof material.

Wooden Silos.

The most approved types are built circular in shape.

(*a*) The circle may be obtained by means of perpendicular staves of pine scantling, secured by means of a series of regularly disposed iron rods, similar to the hoops of a cask; but the ends of rods should have sufficient thread to admit of tightening up. A series of doorways, capable of being made airtight, should be provided. The chief objecton to the "stave" silo is that the constant exposure to the weather makes it difficult to keep them in repair. Sheet-iron lining, with a dressing of acid-proof paint, or else tarred paper, is required.

(*b*) The other and more suitable class is set on a good foundation, and framed with light studding, so arranged as to admit of cutting the necessary doors out after lining is put on—sills being put in with frame. The building may be lined inside and out, and is stronger and better able to resist lateral pressure when completed so. A double lining, with tarred paper between, may be sufficient. In fact, for ordinary economical reasons, a single wall is effective; but it will be necessary to pay particular attention to putting a good airtight coating insde, either with tarred paper and dressing only, or preferably by applying sheet-iron first. A thatched roof, put on after silo is filled, will answer the purpose.

(*c*) Combined Under and Over Ground Silo.—This style works in well when there is a sharp slope on ground, so that excavation may be made for the lower half. Chaffing and filling is carried on from the top, and silage removed from lower side. Another combined style of silo is made by excavating a pit in good holding and well-drained land. The portion above ground may be built as described under heading of (*b*), using single wall, and leaving the lower half simply as a well-excavated pit, but earth must be banked up to insure protection from weather and to exclude air.

(*d*) Square or Rectangular Silos.—These are simply strong overground boxes or receptacles, airtight on sides and bottom. Squared sleepers, halved at joints and adzed flush, serve as a foundation. Studs 6 x 2, 18-inch centres, and securely braced. Inside requires to be double lined with tongued and grooved hardwood. When sheeting reverse order from horizontal to perpendicular, or else break joints. Tongues and grooves require to be treated with tar and resin, and tarred paper should be put in between lining. One or two doorways to be provided for, and roof is necessary.

(*e*) Makeshift Silos.—Square or circular pits may be sunk in dry, well-drained land, but a framework of slabs requires to be put in at surface level, and carried up a couple of feet. Bank earth up around this, and make surface drain to carry off soakage. Good silage may be made in this and many other makeshift silos, provided ordinary attention is paid to the rules governing the making, but chaffed fodder is the most satisfactory. Dry underground wells may be turned to good use as pits.

(*f*) Barn Silo.—Many well-framed barns exist on farms where silos could be built handy to machinery and for feeding out silage to stock.

(*g*) Octagon-shaped silos are favoured by some, and present advantages over rectangular silos, to which objection is made on account of loss at corners.

Construction of Stack.

The foundation requires to be raised sufficiently to prevent soakage, and the particular kind is dependent on the system of pressure to be adopted. Provided base is well firmed, and filled with earth or puddled antbed, to prevent access of air, it is sufficient. Stacks are proverbially hard to build, as fermentation may proceed more rapidly on one side than the other, particularly when a cold wind is blowing. For this reason, it is well to provide a rough framework of uprights, with joints of plates, so cut as to prevent spreading,

but easily removable. With circular stacks uprights may be put in, in the shape of an octagon. Planks or timber may thus be put in to prevent slipping during process of stacking. Square-rectangular, oval-ended, or circular stacks may be built. Size and shape of butt to be dependent on length of fodder, as the binding of each layer must be considered, so as to prevent high crown in centre. When stacking, proceed systematically, and pack stuff as tightly as possible, taking care to keep layers as horizontal as possible, with butts out. The binding should give the heart just sufficient slope to prevent drip from entering stack. Temperatures are generally inclined to run high, so stacking must be kept going to reduce it. Galvanised water pipes, 1½-inch, previously plugged or fitted with spike, may be put horizontally into centre of stack, and left there as work proceeds. Another method is to drive a length into stack when it is desired to take temperature, and remove before proceeding with work. For a more accurate reading of thermometer, place it in metal tube, containing water, lowering all down pipe.

The Upper Crust.—Nothing is gained by attempting to make an artificial airtight covering for any mass of silage. With "sour" there is not much call for doing anything except finish off with good succulent, closely-packed fodder; but with "sweet" the surface gets dry from ruling high temperatures, and it is well to give a good watering, so that a natural crust may be formed. This should not be disturbed.

Capacity of Silos.—A cubic foot of silage, properly compressed, runs from 35 lb. to 40 lb. in weight, and sometimes over; thus, a ton will occupy some 50 cubic feet. If a cow has access to other feed, a cubic foot per day will suffice; but when silage only is reckoned upon to supply the bulk so necessary for ruminant animals, 50 lb. is required.

Feeding out is carried on according to arrangement of silo, or stack-deterioration and mould takes place if exposed more than twenty-four hours. If silo is high and there are a series of doors, feed from top by raking off a thin layer from over the whole surface each day. With stacks, cut down with hay knife or squaring axe, and use gradually from top to bottom of a section.

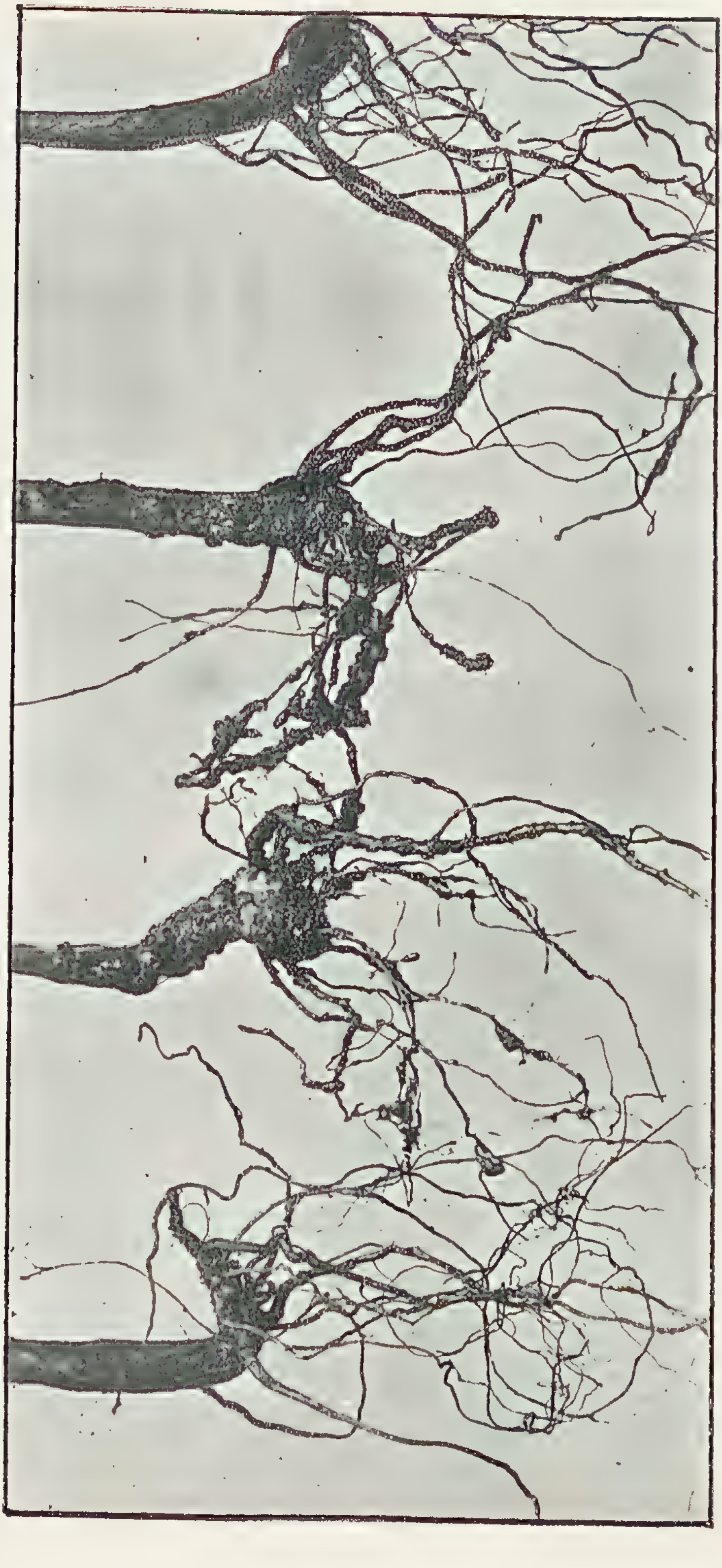
SILAGE AS FEED FOR DAIRY CATTLE.

Chemical changes brought about in the silo are usually a formation of acetic acid, which in turn acts on the starchy matters contained in the fodder, forming them into glucose and assisting digestibility. A certain amount of alcohol is formed from the saccharine matter, which, being volatile, passes off on exposure to the atmosphere. Silage, where properly made and fed to cows, is the nearest equivalent to green fodder or natural grass; but it must be borne in mind that unless made from a suitable combination of fodders, rich in flesh and fat-forming constituents, it cannot be regarded as a perfect food. Maize and sorghums, although supplying much of the carbo-hydrates, are deficient in proteids, and on that account oaten or lucerne chaff with bran or crushed grain should be supplemented when natural food is scarce. Silage is inclined to impart an odour to milk, and is best fed after milking.

NITROGEN-GATHERING LEGUMES.

Our illustration shows the remarkable results of a crop of Canadian Wonder Beans, grown by Mr. T. D. Fraser, at Milton. Leguminous plants such as peas, beans, lupins, &c., have the power of collecting the nitrogen of the air and fixing it on nodules on the roots, as here shown on two of the specimens. The singularity of this case lies in the fact that some of the roots exhibit an exuberance of these nodules, whilst others growing only a yard away from them on the same soil, and treated exactly in the same manner, show none whatever. The previous crop sown on this ground consisted of peas, on which a few nodules were observable. Perhaps some of our readers have had a like experience, and can explain the anomaly.

Plate XIX.



Nitrogen-gathering Legumes.

Plate XX.

The Queensland Court at the A.N.A. Exhibition, Sydney.

Plate XXI.

The Queensland Court at the A.N.A. Exhibition, Sydney.

Plate XXII

Queensland Hoop Pine Butter Boxes at the A.N.A. Exhibition, Sydney.

THE AUSTRALIAN NATIVES' ASSOCIATION EXHIBITION.

The Exhibition of Australian Manufactures and Products opened in Sydney on 20th December, 1905, and continued until 27th January, 1906. The exhibition was the outcome of a resolution of Broken Hill Branch of the Australian Natives' Association, which was placed upon the annual business-sheet for discussion at the conference of 1906, held under the presidency of Mr. P. T. Finegan, and which resulted in a conference being held between the Australian Natives' Association and the Chamber of Manufactures, and the realisation so far as the exhibition is concerned has been very satisfactory. The buildings at the Agricultural Show Grounds, Moore Park, being filled, the committee found that it was absolutely necessary to erect new buildings in order to cope with the many applications for space and to accommodate the large number of exhibits that were forthcoming, and the item of expenditure under this head, together with the installation of electric light, amounted to something like £3,500. The committee received the patronage of their Excellencies the Governor-General and Lady Northcote, the State Governor Sir Harry Rawson, the Federal and State Ministries, the Chief Justice and other judges of the High Court, the Lieutenant-Governor, the Lord Mayor, and others.

The following are some of the trades represented:—Agricultural machinery, ammonia products, art metal, aerated waters, &c.; billiard tables, baths, gas-heaters, bolts and nuts, bottles, box and case, brush and broom, building material, bacon and hams, biscuits, brewing, confectionery, cement, tin and canister work, cutlery, clothing, die-sinkers, medallists, drugs and chemicals, engineering, furniture, floral, filters, foods, exhibits from the different Governments, glue, hats and caps, iron and steel, iron safes, incubators, jewellery, lace, leather, &c.; minerals, metals, marble, marbole, instruments, oilskins, opticians, ostrich feathers from ostriches produced in the Commonwealth, pipes, picture frames, photography, bookbinding, rubber goods, saddlery, sculls, soils, fertilisers and manures, soaps, candles, &c.; stoves, ranges, scales, cash registers, tiles, pottery, tents, rugs, timber, vehicles, wall-papers, wines, woollens, tweeds, wool classing and shearing, wire netting, &c.

There were numerous working exhibits, such as die and tin making machinery, manufacturing confectionery, cooking demonstration of Australian foods, making boots, shoes, and slippers, agricultural machinery.

The Queensland Government was represented by Mr. H. W. Mobsby. There were a large number of exhibits from Victoria and the other States. In addition to the general class of exhibits, there were those of ladies, apprentices, and the private and denominational schools, and the Public Instruction Department made a fine display.

The Queensland exhibits were especially admired, and were visited by hundreds of persons, many of whose friends and relatives, attracted by the splendid agricultural lands and the liberal land laws of the State, are now settled and doing well in various parts of the State. The exhibits comprised timbers, fruits (conserve and canned), minerals, metals, grain (wheats and maize), wool (raw and manufactured), mohair, cotton (raw and manufactured), fibres (raw and manufactured—ropes, cords, binder twines, &c.), sugars (various stages of manufacture), tobacco (raw and manufactured), brushware, coffee (raw and roasted), malted coffee, arrowroot, wine, soups, olive oil, peanuts, dairy produce (cheese, condensed milk, butter, &c.), preserved meats, leathers (raw and manufactured—saddles, bridles, harness, &c.), cordials, mineral waters, coal, tropical products, &c.

There was a very fine exhibit of butter boxes, a few made of New Zealand white pine, which could, however, scarcely have been considered a butter box exhibit such as that made from Queensland pine, as shown in the illustration (Plate XXII.). From inquiries made by Mr. Mobsby, the representative of the Queensland Department of Agriculture and Stock at the exhibition, it would appear that butter is not only exported from Queensland in Queensland pine

boxes, but also from the following factories in New South Wales and Victoria:—

Crown Factory, Gerrengong, N.S.W.; Kangaroo Valley Butter Factory, N.S.W.; Taralga Butter Factory, N.S.W.; Dak brand, Raymonth terrace, Co-operative Dairy Company, Hunter River, N.S.W.; Casino Co-operative Dairy Company, Richmond River, N.S.W.; A.B.C. Dairy Company, Victoria; M.C.B. Co-operative Dairy Company, Victoria; also the following dairy companies in Victoria:—Kialla, Wanalta, Lily Ponds, White Swan, Korumburra, Jumbumia, Silver Wattle, Greenfield, Mayfield, Arawatta, and Surrey Downs.

The trouble about odorous pine appears to lie with the boxes made of New South Wales pine on the northern rivers.

Many inquiries have been made about Queensland fresh fruits, and samples have been asked for. The favourite amongst the Queensland jams exhibited was the Cape gooseberry.

Great interest was taken in the Queensland sisal fibre exhibits, both raw and manufactured, especially in the binder twine, which forms a considerable item of the imports of New South Wales

About 100,000 people had already visited the exhibition at the time of writing.

Our illustrations are from photographs taken by Mr. W. H. Mobsby, artist to the Department of Agriculture and Stock, who is in charge of the Queensland exhibits.

MACHINE-WRAPPED ORANGES.

In our issue of June, 1905, we drew attention to the invention of a machine for wrapping oranges in paper. We now have the following additional information about this device in a Florida, U.S.A., paper:—

The advent of California oranges into the markets wrapped with labels bearing the stamp, "Machine-wrapped fruit, not handled by hand," makes information about the type of machine especially interesting.

The machine is attached to the end of the grader, and receives the oranges direct. It is simple in operation, compact, and perfectly automatic. It receives the fruit on an endless chain, attached to which are a series of cups, felt-lined and separated by rubber partitions. The wrappers are cut from a roll, after the manner of a perfecting printing press, and, after being printed, are cut the desired size, when they are ready for the orange. A unique device twists the paper perfectly tight about the orange, which is held in place at the top by a rubber plunger, while the other end rests on a felt-topped rod. The ends of the orange are in this position, and so closely is the orange wrapped that it is believed it will be practically impervious to moisture.

A feature of the machine that will appeal to packing-house men lies in the fact that a smaller-sized paper can be used than in hand-wrapping. Thus, a nine-by-nine wrapper would be used on the machine, while in hand-wrapping a ten-by-ten wrapper would be required. A saving of 20 per cent. of paper is claimed as well as far superior wrapping. Another advantage would lie in the fact that no large stock of assorted wrappers would be required, since the machine can be adjusted to any size, and the roll paper only would be needed. The printing of wrappers would also be done away with, since the printing is a part of the wrapping process.

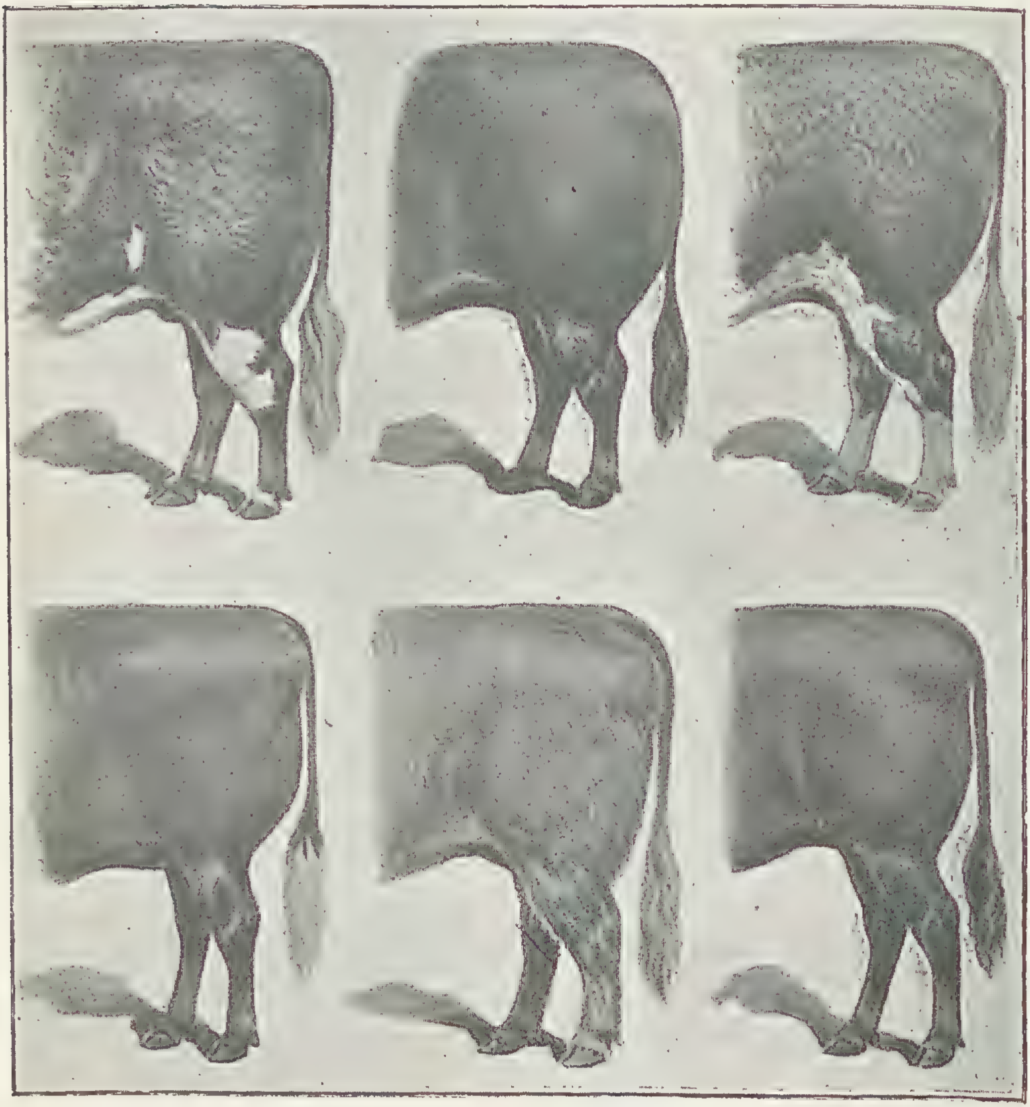
To prove that the machine will not mar the skin of the fruit, eggs have been run through the machine and wrapped without cracking a shell.

The machine wraps 72 oranges a minute, or 40,000 pieces of fruit every ten hours. It would wrap a carload in one and one-half days. For the ordinary packing-house, five machines would be necessary to handle the fruit.

Practically all the packers in the city have inspected the machine, and all are enthusiastic over its possibilities.

With labour a scarce and high-priced commodity in California, this invention ought to be a great factor in making the citrus business pay better profits.

Plate XXIII.



Typical Hindquarters of Fat Cattle.

Dairying.

WHAT IS A FAT BULLOCK?

The "Farmer and Stockbreeder," from which we take the illustrated "Study in Steaks" and the remarks on a fat beast, calls it an ox. We prefer our colonial term, "bullock."

"What is a fat ox?" asks the writer. "Ah!" he says, "that is precisely what many muffs in the farming world have need to learn, and others, too, for that matter, who may be fairly well up in their occupation otherwise. Many a man knows better how to fatten his animal than to tell when it is fat. And whether or no the ox or heifer be fit to go may make, and very likely will, 1d. per lb. difference in price realised, and these pence represent profits very often. There are nice tight little heifers and steers that make their way pretty well good as they go on, and here esteemed points are likely to be found when sought for. But, on the other hand, there are big-boned, three-cornered, inapt fatteners that require a lot of ripening up, and need careful examining to ascertain when they are really fit to go. The ripe beast has a well-developed chine, well-covered ribs, fully-developed loin, wide hips well flesh-capped, good rumps, projecting twist, a double handful of flank, large scrotum, deep wide brisket pushing well forward. Though this under-beef is not the part to fetch the money on the butcher's slab—and he knows it—it indicates weight in the carcass that no other point does. Finally, there is a certain touch which tells the initiated when the carcass is ripe—even a firm but pleasant touch which yields but little to pressure—while uniform fleshiness all over the carcass is essential, or at least desirable. But, dear me! the handling of a fat bullock is becoming almost a lost art in these days of auction marts, and it is vain for the feeder to hope to know when his beast is fit to go if he knows not the meaning of information given in the examination of almost every point."

A Study in Steaks.

The artist has endeavoured to interpret in the accompanying illustration what we have called "A Study in Steaks." The object is to show by contrast the characteristic formation of well-known breeds in their relation to steak production.

From left to right the Top Row represents: Shorthorn, Aberdeen-Angus, and Hereford. Bottom Row: The Devon, the West Highland, and the Red Poll.

THE VALUE OF THE GOAT.

Writing on the subject of the common (not the Angora) goat, a correspondent at Nikenbah, Maryborough, says:—"I am aware that the common goat does not, as a rule, command the sympathy of the general public, but let me show how these animals can be of great use to the settler on new scrub lands.

"I felled two pieces of scrub, each of about 20 acres, nearly at the same time. The timber on each block was burnt off about six months ago. On one of the cleared portions my goats were allowed to roam at will, with the result that to-day there is scarcely a sucker of new growth or a weed to be seen. On the second block, which was protected from the goats, the new timber growth is 3 or 4 feet high, and would cost at least 15s. an acre to bring it to the condition of the other piece on which the goats browsed."

Poultry.

FEEDING AND FATTENING CHICKENS.

Although many persons both in town and country keep fowls, few pay much attention to the proper feeding of chickens, and fewer still take the trouble to fatten them scientifically for market. With regard to feeding young chickens, let us see what Mr. Robert J. Terry, poultry expert of the Agricultural and Stock Department of Tasmania, has to say about this important matter:—

Chickens do not require any food for at least thirty hours after they are hatched. Strange as it may seem, sand or fine gravel should be the first thing consumed by the chick, which, all through its life, it should have free access to. The first food may consist of hard-boiled eggs, finely-chopped, and bread-crumbs, or bread that has been soaked in milk (skimmed or fresh), and then squeezed dry. Bread and water would not do to feed chickens on. Why milk is used is that it counteracts the yeast in the bread. Water does not do this, hence bowel trouble. After the second day of feeding, what is known as the dry method of feeding may be adopted, which is a combination of broken grain and seed. The combination which should be strictly adhered to is—

Cracked wheat, 25 parts.
Hulled or cut oats, 15 parts.
Millet seed (white), 12 parts.
Small cracked maize, 10 parts.
Small cracked peas, 6 parts.
Broken rice, 2 parts.
Rape seed, 1 part.
Small grit, 10 parts.

Rolled oats may be used in the place of hulled oats where they cannot be obtained. Perhaps better results even can be secured, where quick growth is required, by feeding part dry system and part ground meals damped. The great advantages of the dry system are the saving of time, as sufficient food for the day may be thrown down in chaff or other suitable material for scratching for the day, and the avoidance of bowel troubles.

FATTENING.

The fattening of poultry in some countries is really looked upon as a profession in itself, and may be looked at from two points of view—namely, the producer's and consumer's.

The consumer's point of view: When you buy a lean chicken you buy a tremendous lot of offal and bone, and very little meat.

The producer's point of view: Does it pay the producer to fatten chickens?

The following must prove the advantages of fattening:—Before starting an experiment on a rather large scale, three average chickens were killed, dressed, and cooked. It was found that the meat of the three chickens weighed 2 lb. 6 oz., and the bones 1 lb. 2 oz. The remainder of the chickens were then put into crates and fatted, and at the end of that period three of the average chickens were killed, dressed, and cooked; the meat from these three fatted chickens weighed 7 lb. 6 oz., and the bones 1 lb. 11 oz. This experiment showed with the fatted chickens a gain in choice, edible meat of 5 lb., and a gain in weight of bone of only 3 oz. for each chicken. Moreover, this does not take into consideration the improved quality of the flesh of the fatted chickens. This experiment was extended far longer than was necessary.

Another experiment was with seventy-three chickens. They were a good average lot, chiefly ordinary farmyard stock that had been graded up by pure-bred roosters. They were divided into four lots. It was endeavoured to have each chicken weigh as nearly 3½ lb. as possible at the commencement of experiment. One lot was treated as ordinary farm chickens, being allowed to run out and get all the exercise they wished to take; another lot was in a shed, the birds having no outdoor exercise; the third lot in crates, which will be fully described later on; the fourth lot in similar crates, but during the last ten days of the experiment the chickens were fed by the cramming machine.

The chickens were all fed with similar food, the food used being one part each of maizemeal, oats, and barley. During the last ten days a little fat was also fed.

The result of the experiment was as follows:—

	Lot 1—Crammed. Lb.	Lot 2—Crates. Lb.	Lot 3—Shed. Lb.	Lot 4—Loose. Lb.
Weight at beginning of experiment ...	70	75	64	60
Weight at close of experiment (three weeks)	106½	93¼	67½	75½
Gain	35½	18¼	3½	15½

The following experiment will show what many a farmer will gain by fattening. It will be seen that 131 chickens gained in weight 335½ lb. in four weeks. The chickens were in a healthy but very lean condition when placed in the fattening crates, and were fed out of a trough throughout the fattening period. The cramming machine was not used. Breed of chickens: Plymouth Rocks and Orpingtons:—

Period—Weeks.	Number of Chicks.	Live Weight. Lb.	Gain in Weight. Lb.	Meal. Lb.	Skim Milk. Lb.
Commenced ...	131	491½	—	—	—
1st	131	654	162½	252	438½
2nd	131	677½	23½	227	435¼
3rd	131	756¾	79¼	286	464
4th	131	827	70¼	286	534

Average gain in weight per chicken, 2 lb. 9 oz.; cost of feed per lb. of grain, 2¾d.

A cramming machine is not an absolute necessity for fattening poultry; first-class chickens can be turned out without its aid, provided that the owner understands his work. It is impossible to fatten fowls when running at liberty (unless it is the game fowls, which will fatten naturally), but a fortnight's confinement in a coop and liberal feeding of soft foods will do wonders. The confinement is necessary because birds at liberty will walk about, develop muscle, and harden the flesh; the fowl in confinement does nothing but stand still, eat, and sleep. It is, of course, very unnatural, and its health and appetite suffer after a time, but before this stage arrives the bird is killed. All fowls are allowed to feed themselves at first in the fattening coops; when the machine is used, it is for finishing them off.

The fattening coops should be made as follows:—6 feet long, 16 inches wide, and 20 inches high, inside measurements. Each crate is divided by two equal partitions into three compartments, each of which holds four or five chickens, according to size. The frame pieces of the coops are 2 inches wide and ⅞ of an inch thick. This frame is covered with battens, which are placed lengthways on three sides (bottom, back, and top), and up-and-down in front.

The battens for the bottom are ⅞ of an inch wide and ⅝ of an inch thick. I, personally, have found that ½-inch wire mesh stretched across the bottom is better than this. The back, top, and front battens are the same width, but only

⅜ of an inch thick; the spaces between the battens in front are 2 inches wide, to enable the chickens to feed from the trough. The top battens are 2 inches apart, and the back ones 1½ inches. The top battens are cut above each partition, and six strips 2 inches wide are nailed under them; the three doors so formed are hinged to the rear corner piece. The coops are placed on stands 15 inches from the ground. The droppings from the chickens are received upon sand or other absorbent material. A light V-shaped trough 2½ inches wide inside is placed in front of each crate, and carried on two brackets nailed at each end of the coop. The bottom of the trough is 4 inches above the floor, and the upper inside edge is 2 inches from the crate. They may be placed under cover or outside, according to the season of the year.

The birds should remain in the fattening crate for a period not exceeding twenty-one days. Some chicks will fatten more readily than others. These should be picked out a week before finished, and during this last week it is as well to add 2 oz. of mutton fat each meal per bird to the backward ones. Before the chicks are placed in the crates they should be well dusted with sulphur, to kill any lice. Do not give any food for the first twenty-four hours after placing birds in the coops. It is necessary to feed the birds lightly during the first few days. They should be fed three times a day, but do not give them quite as much as they can consume; fresh water twice daily, and grit two or three times a week. After the birds have been in the crates five or six days they should be given, twice a day, as much food as they will eat. Twenty minutes after feeding, the troughs should be removed. The chicks should be starved thirty hours before killing. This will prevent the food remaining in the crop and intestines. Several hours after the last feed allow the chickens what water they wish to drink, then take it away, and give them no more. A satisfactory fattening ration is one that is palatable, and will, at the same time, produce a white-coloured flesh. One of the best of these would be oat dust, which is the fine flour or dust obtained from making oatmeal or rolled oats, and is now, in most cases, mixed with pollard. This substance, mixed with skim milk to the consistency of porridge, and fed to the birds with the addition during the last ten days of 1 oz. of melted mutton fat to each bird, is one of the most satisfactory rations that could be given. Other rations would be 2 parts second-grade flour, 2 parts ground barley, 1 part pollard; equal parts ground oats, ground barley, ground wheat; 2 parts ground oats, 1 part ground barley, 1 part ground wheat, 1 part ground maize. All of these should have the addition of mutton fat during the last ten days.

The following table shows the difference in the weights of representative chickens killed before being fattened and similar chickens killed after being fattened for thirty-six days:—

WEIGHT OF THREE CHICKENS.

	Before Fattening. Lb.	oz.	After Fattening. Lb.	oz.
With feather off	8	8	16	4
Ready for cooking	5	2	11	6
After being cooked and left cool for two days	3	8	9	2
Bones	1	2	1	11
Edible portion	2	6	7	6

This shows that there were three times more edible portion from the fattened chickens than from the others, and every ounce of it was of better quality.

The value of charcoal must not be under-estimated. It is of much help in keeping fowls in health, and preventing looseness of the bowels. Feed it, powdered, in the food two or three times a week.

It has been found that chickens for market will fatten faster if fed on charcoal. Charcoal is not a medicine, strictly speaking. It is an absorbent, and as such takes up the poisonous gases in the system and carries them off. It is practically harmless in any amount.

Types of Poultry.

Though not immediately coming under the heading of poultry, it might be as well, for the information of all interested, to give a couple of types of chickens, one of which would fatten well, while the other would not. Fig. 1 is a type that is, unfortunately, still seen on some farms. Note the narrow

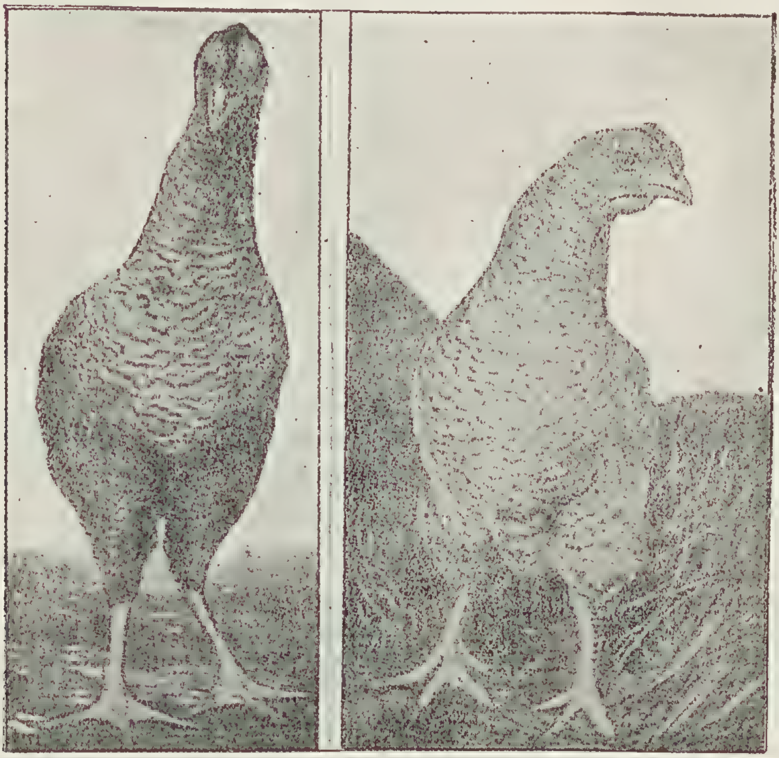


Fig. 1. Fig. 2.

head and long beak, sunken eye, poorly-developed neck and breast, thighs too close together, weak in the hocks. This type would not fatten profitably. Fig. 2—Note the broad head, strong beak, full bold eye, good neck, prominent breast-development; also the width between the thighs. This bird is a good shape for fattening.

The above article, taken from Bulletin No. 7 of the Department of Agriculture of Tasmania, contains such precise directions for fattening poultry for export that we shall not be surprised to hear that many who have up to the present taken little trouble about the matter will now make the experiment. The Queensland Department of Agriculture and Stock has fairly shown the way to the London market; its poultry expert is prepared to do everything necessary to assist shippers with advice, so that their birds may arrive in good saleable condition and at the season when the best prices are obtainable. The matter thus lies in the hands of the poultry-breeders themselves.

Apiculture.

THE BRITISH MARKET FOR HONEY.

Several small shipments of Queensland honey have during the past few years been sent to London, in the hope that a remunerative market might be found for our surplus product. The results of these consignments have met with no better success than have those made by the beekeepers of the southern States, and it has been clearly shown that when 2d. to 3d. per lb. can be obtained for honey locally that price will pay the apiarist far better than if he were to sell it in the London market. It appears to be impossible to eradicate the idea which has become fixed in the mind of the British consumer that all our honey is tainted with the objectionable eucalyptus flavour. As a matter of fact, very little of the honey produced in Queensland exhibits that taint. But, owing to eucalyptus-flavoured honey having been occasionally shipped to England, it appears to be quite sufficient for honey to hail from Australia in order to be branded at home as eucalyptus tainted.

About the middle of last year the Department of Agriculture in South Australia and a gentleman interested in the honey trade once more essayed the home market. The Department forwarded four 30-lb. samples of first-class honey to the Agent-General in London, and Mr. J. W. Sandford sent half a ton of prime honey to his brother in England. In October last Mr. Sandford's brother wrote as follows:—

"As you requested, I earnestly took up the subject while in London, securing all information necessary to obtain a true conception of the position and prospects for opening up trade in this line of Australian produce. Many attempts in the past have been made to develop a profitable export outlet for Australian honey, but usually these ventures have proved unsatisfactory and often disastrous, owing chiefly to the strong eucalyptus flavour which is associated with most Australian honey, and to which the European buyer's palate has never become accustomed. That finest flavoured honey can be raised in Australia is evidenced by small quantities of garden sorts, taken just at such times (as in the vicinity of Adelaide, we notice) when the orange blossom and other sweet flowering plants are out; but the quantity of this fine grade is so limited that local demand for it even cannot be filled, although there is a surplus annually of qualities ranging from 'good' to 'dark, ill-flavoured' samples, most of the latter coming from scrub country. The ten cases you shipped to me at London were of fair quality, uniform, and of good texture, but having the usual pronounced eucalyptus flavour. It was submitted to leading dealers and experts, its value tested on the market, and the appended certified report obtained, from which you will see that, even if means could be devised to extract the flavour objected to, its average market value in London is only about 2d. per lb. The report is accompanied with a set of samples in small bottles, each having a descriptive label, showing the country from which it is obtained, and the selling value on London market at time—viz., July of this year. An examination of these samples and comparison with Australian honey must, I am sure, prove interesting to your board, and satisfactorily show that the extravagant statements 'as to high values ruling for honey' cannot be verified, at any rate, in the world's chief markets. It is regretable that the results of our investigations gave but little hope of profitable market being opened. Large quantities of 'dark, ill-flavoured' come forward, chiefly from South American countries, most of which finds sale to manufacturers of cheap toffey and candies, but I fear that it is against this competition Australian honey would have to be pitted. By looking at the Canadian, New Zealand, and Californian samples it will be seen that a market exists which would give Australian producers about 3d. per lb. net, in 60-lb. tins, if similar quality and fine flavour could be raised in sufficient quantities to export. The attention of chemists and others might be directed to the extraction of the objectionable flavour from the

honey, without impairing its quality or rendering it impure. If this could be achieved, it very probably would pay to raise honey over lots of our scrub country.—I am, yours, A. W. Sandford."

The following is a copy of the expert's report:—

"I hereby certify that I have examined the two samples of Australian honey submitted to me by Mr. A. W. Sandford, of Adelaide, Australia, and find them to be of very good quality, but strongly scented with eucalyptus. As regards the possibilities of extensive sale in this country, it would be almost imperative to lessen or extract in some way the strong odour above mentioned, which to the English palate is objectionable in an article of food. I know no reason, provided this one objection can be overcome, why Australian honey should not find a ready sale in English markets, of hundreds of tons annually, at values ranging from 16s. to 22s. per cwt., according to the market. The present value of similar honey, with equally good appearance and a better taste, is about 20s. per cwt., ex wharf, London. Could the honey be 'guaranteed pure' it would greatly enhance its reputation, and bring it more speedily to the front. For further guidance, I send you herewith samples of various honeys, with present relative values marked thereon, as under:—Jamaican: Varying in texture and colour, but very extensively imported in casks of about 3 cwt. each, and cases, each 2 x 56-lb. tins, 28s., 23s., 20s., 17s. 6d. per cwt, according to quality. Californian: Very good flavour and colour, and very much sought after, on account of its clearness, usually imported in cases containing 2 x 60-lb. tins, 32s. per cwt. Peruvian: Small quantities imported, chiefly to Liverpool, in 60-lb. tins. Canadian: Of varying grades, importation at present small, but being earnestly pushed by the Canadian Government, cases each 2 x 56-lb., 32s. to 26s. per cwt. Argentine: A fair quantity imported in casks and cases, each 2 x 56-lb. tins, but on account of its smoky taste has a very small sale, and then only at cheap rates. New Zealand: A small quantity imported in cases, each 2 x 56-lb. tins, and fetches high prices on account of its delicate flavour and colour, 24s. per cwt. French: From Narbonne district, well known and much appreciated in this country—(Signed) J. Hy. Ironmonger, 119 Common street, London, E.C."

The samples submitted by Mr. Sandford were tasted by the members of the board, the Californian and Canadian honey coming in for special comment. These were very much lighter in colour than South Australian honey, and were of fine flavour. The other samples varied considerably in colour and texture, and in most cases were possessed of a very marked flavour, not altogether appreciated. Colonel Rowell said he had a good many years' experience with honey, and considered that much of their South Australian honey was equal to the best of the samples shown. He was unable to detect the eucalyptus flavour about which they heard so much, but at the same time they must bear in mind that if they were to develop the trade they had got to study the taste of the consumer in England, whether it agreed with theirs or not.

The report on our honey is not very encouraging. Unless it will fetch more than 22s. per cwt., there is not much prospect of trade, as, allowing that the whole cost of putting it on the London market will not exceed ½d. per lb., it will leave less than 2d. per lb. net to the beekeeper. Even the best Canadian was fetching under 3½d. per lb.

THE NEXT DROUGHT.

Mr. Clement Wragge, the late Government Meteorologist in Queensland, in writing to the London "Standard" recently, foretells another drought, and ends his letter as follows:—"Now is the time for Australians to wake up and lock the rivers for water conservation and irrigation. Better so than trying to keep out the Japanese. For another Australian drought will attach to the next solar minimum after 1910 as surely as little apples fall in autumn. Laughing and ridicule will never alter fact, and Galileo's spirit will bear full witness."

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND AND NEW GUINEA.

By F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order—GUTTIFERÆ.

GARCINIA, Linn.

G. Warrenii, *F. v. M.*, Vict. Nat., Nov., 1891.—Fruit in clusters of three, terminating short branchlets, depressed globose, 2-celled, $1\frac{1}{4}$ in. or more in diameter (not seen quite ripe), glaucous; flesh, white, of a pleasant flavour, rind thin, like that of *G. Mestoni.* Seeds, 2; testa, brown. Stigma, sessile, thick, 4-lobed; lobes bluntly toothed, thus giving to the entire stigma a crenulated appearance.

Hab.: Coen, *R. W. Garraway.*

Order—SOLANACEÆ.

SOLANUM, Linn.

Subsection—CRYPTOCARPUM, Dun. Sol.

S. rostratum, *Dun. Sol.*—A prickly, somewhat hoary or yellowish plant. Both stem, leaves, and inflorescence clothed with a close stellate-pubescence and pale-coloured prickles. The leaves resemble in form those of the water-melon. Flowers, in racemes of from 3 to 9 flowers, more or less secund, especially in fruit; pedicels, 4 to 5 in. long. Calyx-tube, closely-fitting and enlarging with the berry; lobes, free, lanceolate, stellate-pubescent, but without the larger pale prickles of the other parts of the plant. Corolla, under 1 in. in diameter, yellow, densely clothed outside with stellate hairs. Stamens, declinate, unequal; anthers tapering upwards, dissimilar, the lowest one much longer and larger with an incurved beak. Berry, globose, about $\frac{1}{2}$-in. in diameter, deep-green, glabrous. Seeds, punctate and coarsely undulate-rugose. *S. heterandrum*, Pursh. Fl. Amer.

Hab.: Plains of Nebraska to Texas (Mex.) This plant is becoming naturalised in Southern Queensland, and it is probable that what I recorded, from seeing the fruit only, in last month's Journal as *S. barbisetum* belongs to the above, of which I now have good specimens. The bad qualities then mentioned apply equally to the present plant.

Order—GRAMINEÆ.

PANICUM, Linn.

Series—DIGITARIEÆ.

P. glabrum, *Gaud.*—A dwarf, densely matted grass, seldom exceeding 12 in. in height. Leaves, linear-lanceolate, acute, glabrous, orifice of sheath hairy; ligula, membranous, prominent. Panicle of from 2 to 6 spikes (usually 2 or 3), 1 to 2 in. long, suberect or divaricate, green or reddish. Rhachis, narrowly winged. Pedicels, nearly glabrous. Spikelets, imbricate, about 1 line long, elliptic, subacute silky, but variable in hairiness; the hairs often with slightly clavate tips. Outer glume, minute, 2nd and 3rd 5-nerved, 3rd quite smooth, ovate-oblong acute. *Paspalum ambiguum*, DC., in Hook. Fl. Brit. Ind., VII., 17.

Hab.: Becoming naturalised about Nudgee, *A. H. Benson.*

Series—PASPALOIDEÆ.

P. polyphyllum, *R.Br.*, Prod.; *Benth.*, in Fl. Austr., VII., 477.—Stems, from a decumbent and branching base lengthening and ascending to above 2 feet. Leaves, linear-lanceolate, pubescent, with a narrow-cartilaginous, frequently undulate margin. Panicle, slender, of few distant simple slender secund and spreading branches, 1 to $1\frac{1}{2}$ in. long. Spikelets, rather distant along the rhachis, alternate but not in two distinct rows, ovoid, acute, about $1\frac{1}{2}$ line long, contracted at the base and sometimes shortly pedicellate, with a few hairs or bristles on the pedicel. Outer glumes, thinly membranous; the lowest about half as long as the spikelet, broad, rather acute, 3-nerved; the 2nd and 3rd nearly equal; the 2nd with five, the 3rd with three, prominent nerves. A narrow palea in the 3rd glume. Fruiting glume, smooth or minutely rugose under a strong lens. Trin. Spec. Gram., t. 177; *F. v. M.*, Fragm., VIII., 194.

Hab.: Amberley, near Ipswich, *Clark T. Seymour.* This grass, as pointed out by Muller l.c., is a near ally of *P. distachyum*, one of our best fodder grasses, and should be encouraged to spread over our pasture lands; previously it has only been met with in tropical Australia—namely, Islands off the North Coast, Port Essington, and Port Darwin.

FLORA OF NEW GUINEA.

Order—ORCHIDEÆ.

DENDROBIUM, Swartz.

Section—APORUM.

D. litoreum, *Bail.*, *sp. nov.*—Stems appear to grow in tufts, height 4 to 5 in., flattened, somewhat flexuous, about 2 lines broad, less at the base, internodes short, clothed by the scarious strongly striated leaf-sheaths. Leaves, distichous, about $1\frac{1}{4}$ in. long, lanceolate, slightly falcate, coriaceous, and strongly striate, equitant at base, the fracture between sheath and blade very oblique. Flowers appear to be numerous in a terminal head of many bracts. Pedicels, filiform, 7 lines long. Ovary, 2 lines long, with winged ribs. Flowers, white, about 1 in. long; two-thirds occupied by the broad, falcate spur. Sepals and petals, broad-lanceolate, of nearly equal size, very delicate, with three or four longitudinal faint nerves and wavy or branching veins between them. Labellum, about 9 lines long, cuneate in outline, ending in two somewhat spreading, jagged lobes. The disk calli yellow, forming two dense rows, which terminate a short distance within the margin below the terminal sinus. Column very short, its membranous wings extending upwards and forming a point behind the anther. Anther-lid hemispherical, slightly tomentose. Pollen-masses, free, white. Stigma, large, amber-coloured.

Hab.: Cape Nelson, Collingwood Bay, British New Guinea. On mangrove-trees, *Rev. Copeland King.* After a considerable amount of search, I have not been able to find that the above plant has been described; therefore, have attached to it the above name. It seems a close ally of *D. terminale* (Parish and Reichb.) of India. The species is pretty and well worthy of cultivation, but would probably require the protection of a house during our winter months.

D. Coxii, *Bail.*, *sp. nov.*—Stems numerous, from a shortly branched creeping rhizome, from the underside of which roots are emitted, which penetrate the old bark of the trees upon which the plant grows. Stems, drooping, numerous, bulbous at the immediate base; then very slender for 4 to 6 in., not exceeding 1 line in diameter; then gradually expanding for a length of from 2 to 6 in. to about 4 lines broad, and prominently 4-angular; the internodes throughout the stem numerous, none exceeding 9 lines in length, often much less. Leaves (which I have not seen) are said by Mr. Cox to be "distichous, 2 or 3, small, of a light-green colour, produced near the top of the stems." Bracts at base of pedicel, 3; outer broadly-ovate, acuminate, 2 lines long, and nearly as broad; the 2nd as long, but much narrower; the 3rd filiform, and rather longer than the others. Pedicel, rather stout, 5 lines long, including the ovary.

Sepals of equal length, 11 lines long; the dorsal, 4 lines broad, lateral ones somewhat more and linear-lanceolate, forming at their base a broad short spur; longitudinal nerves, about 7, very faint, like the transverse veinlets. Petals, nearly the length of the sepals, but narrower; the midrib somewhat prominent. Labellum, much shorter than the other segments, very broad, forming a cuspidate cup by the terminal lobe; sides of the cup marked with about 12 almost parallel lines of a lilac colour. Disk lines, 3, but slightly raised; beyond these, quite at the base, is a large tongue-shaped raised gland. Column, short, side wings rather broad. No pollen-masses in the flower examined.

Hab.: The material received for the determination of the above species consisted of a single, loose flower, and a few dead stems attached to a portion of the rhizome, forwarded to me by Editor of "The Garden and Field," Adelaide, for determination. The plant was growing in the garden of *Mr. E. Baxter Cox*, of Walkerville, near Adelaide. The above name is given only provisionally, waiting more complete specimens.

Tropical Industries.

MARKET FOR SISAL HEMP IN GERMANY.

We lately sent a sample of Murva fibre (Bowstring hemp) to a German rope manufactory at Mannheim-Neckerau, with a request for a valuation of that and of sisal. The proprietors very courteously sent a reply by the last mail to the effect that the market for sisal and similar fibres generally is such that it cannot fail to handsomely pay the producer of the raw material. With respect to the sample of Murva received, they considered it a very useful fibre, with only one fault. Not being quite white, it had not so good an appearance as the sisal. The reason for this was that the sample had been produced by retting the leaves in water for four weeks. Sisal, Fourcroya, and Murva should not be retted, but be at once cleaned in a scutching machine, when they retain all their lustre. The company buy the best sisal, &c., in the large continental markets up to £40 per ton. There had been a rise in prices during the last two months (December, 1905, and January, 1906), so that the sample of Murva, although dark, would be worth £35 per ton.

We have already described the Murva, its cultivation and manufacture (Q.A.J., Vol. XVI., Oct., p. 194). Seeing the ease with which the plant can be grown and harvested, and the heavy yield of 5 tons of fibre per acre, and the certainty of a good market for any quantity of it, it is surprising that we have still to class its cultivation under the head of neglected industries.

COTTON-GINNING ESTABLISHMENT.

Cotton-growers will be glad to know that Messrs. J. Kitchen and Sons, Eagle street, Brisbane, are now installing ginning machinery in Chester street, Fortitude Valley, with the intention of handling this year's crop of cotton. They are offering 1½d. per lb. for good, clean average quality seed cotton delivered in wool bales at Brunswick Street Station, Brisbane. Long staple and inferior sorts will be valued and the price fixed according to quality. Messrs. Kitchen and Sons are also prepared to gin on growers' account at one-third of a penny per lb. of seed cotton, the ginnery retaining the seed. We think the latter arrangement should suit growers even better than selling outright, the terms being very advantageous. The proprietors will be prepared to sell seed to growers on very reasonable terms. Now that there is a market at their very doors, we trust that farmers will take advantage of it, and put in large areas collectively of this highly remunerative crop.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

BY J. C. BRÜNNICH, Agricultural Chemist.

EIGHTH LESSON.

METALS CONTINUED. METALS OF THE ALKALINE EARTHS: CALCIUM, MAGNESIUM. EARTHY METALS: ALUMINIUM.

Metals of the Alkaline Earths.—To this group of metals belong the elements *Calcium*, *Strontium*, and *Barium*, of which only the first is of importance to us. These elements show again a remarkable relation to each other, and they frequently are found associated in Nature.

The metals tarnish easily exposed to the air, forming oxides and hydroxides. They decompose water at ordinary temperature, forming hydroxides.

The hydroxides are strongly alkaline, and soluble in water. Calcium sulphate is the least soluble of the sulphates. The barium sulphate is insoluble; the others are sparingly soluble.

Calcium = Ca.—This element is in its compounds very widely distributed in Nature; and in the form of its oxide, CaO, *Lime*, is of the greatest importance, being used directly and indirectly in many arts and manufactures.

In Nature, calcium is found in the form of *carbonate of lime* in limestone, marble, coral; *sulphate of lime*, in gypsum, alabaster; *phosphate of lime*, in apatite, phosphorite; and, as *silicate of lime*, it forms part of the oldest rocks. Calcium is a yellow metal of no practical importance to us.

Calcium oxide, CaO—*Burnt lime, Quicklime.*—It is prepared when limestone, marble, coral, or shells are heated to redness. The carbonate is decomposed, giving off carbonic acid gas, and losing about 45 per cent. of its weight—

$$CaCO_3 \text{ heated } = CaO + CO_2.$$

The carbonic acid has to be removed as it forms, and for this reason the operation is generally carried out in specially constructed *lime kilns*, which are charged with alternate layers of limestone and fuel, the burnt lime being continuously drawn off at the bottom. When sprinkled with water, the quicklime, under evolution of a great amount of heat, swells up to about $2\frac{1}{2}$ times its bulk, and crumbles at last into a fine white powder of **Calcium hydroxide,** $Ca(OH)_2$, *slaked lime* (*Experiment 57*). If quicklime is left exposed to the air it will draw moisture from the air and slake itself gradually, forming *air-slaked lime*—*mild lime*—which contains about half its weight of carbonate of lime, as the lime absorbs at the same time carbonic acid from the air. By adding more water to the quicklime than is required for slaking, we obtain a mixture of lime with water, called *milk of lime.* By using 1 part of quicklime and about 3 parts of water, we obtain a thick paste, which, exposed to the atmosphere, will By mixing sand to the paste, we obtain *mortar.* The sand not only prevents set hard in a few days, under evaporation and absorption of carbonic acid gas. shrinkage and cracking of the water on drying, but also makes the whole mass more permeable for an easier absorption of carbonic acid from the air.

Calcium hydroxide is slightly soluble in water. The saturated solution, containing about 1 part of $Ca(OH)_2$ in 700 parts of water, is called *lime water* (*Experiment 58*). When lime water is boiled some of the lime is deposited, as lime is less soluble in hot water.

Lime water is used medicinally as an antacid, and also to supply lime to the system, which, in our State, where in many places rain water is almost exclusively used for cooking and drinking purposes, is often necessary. The best way is to mix from one to four tablespoonfuls of lime water with a little milk. Lime water, taken internally, has been known to be an effective cure for warts.

Slaked lime is largely used for building purposes in the form of mortar, for the cleaning of hides in tanneries, for the clarification of the canejuice in sugar mills, in glass factories, for the manufacture of caustic soda, for the purification of illuminating gas, &c. A thin paste is used as *whitewash*, to keep dairies, stables, and outhouses clean. Painting roofs on the outside with a good whitewash will lower the temperature considerably, as the heat is nearly all reflected. Galvanised iron roofs, which in summer time get so hot that they can be hardly touched by hand, will be found after painting to be quite cool. An excellent **whitewash,** which adheres well to the iron, and lasts for years, and has been successfully used all over our State, is prepared as follows:—Fill a bucket or kerosene tin about quarter full of good fresh quicklime (in lumps), and add to this a good double handful of common salt and lump of tallow the size of a fist; now slake the lime gradually, stirring well to incorporate the salt and tallow; add water gradually until the right consistency is obtained. According to the quality of the lime you will obtain from one to one and a-half tins full of whitewash. It is better to apply the wash not too thick to get an even coat. Rain, if not falling within a few hours, will not wash the lime off.

Lime is largely used in agriculture for the improvement of soils, and, according to the requirements of the soil, is applied in the form of burnt lime, air-slaked lime, or again as carbonate (shell sand) and as sulphate (gypsum). Lime itself is a plant food, but its chief action lies in its properties to destroy acidity in the soil; to precipitate and destroy the ill-effects of certain soluble iron salts; to improve the texture of heavy clays; to help in the process of nitrification; to liberate other plant foods from the soil; and to help in the decomposition of the vegetable matters in the soil.

As a *plant food* lime helps with the potash in the process of assimilation, in the production of the carbohydrates; and for this reason we find lime chiefly in the ash of leaves and young twigs. As seeds generally contain only small amounts of lime, the young seedling plant requires lime very early for its healthy development. Another important function of lime in plant life is the neutralisation of the poisonous oxalic acid, which is always produced during plant life; and the insoluble calcium oxalate is deposited in the form of fine crystals (raphides), which, with the aid of a microscope, are easily seen in the tissue of a very large number of plants—for instance, rhubarb, onions, &c.

The action of lime on the acidity of the ground is, on account of its alkalinity, easily understood. Acids are formed by the decomposition of the vegetable matter in the soil; the young roots of living plants secrete at their tips vegetable acids, which help to dissolve the mineral matter in the soil. All these acids tend to accumulate, and the presence of lime in the soil is necessary to destroy their injurious action.

Many soils, more particularly wet and swampy soils, contain injurious soluble iron salts. An application of lime makes these salts insoluble, in forming an insoluble iron hydroxide (*Experiment 59*). The action of lime on clay can be shown also experimentally (*Experiment 61*). The action is a purely physical one; the lime coagulates the clay, and makes the soil more friable and porous. The action of the lime of rendering other plant foods available is a more complicated chemical process; the lime acts on the insoluble silicates present in the soil, replacing and liberating potash.

A dressing of quicklime at the rate of 500 to 1,000 lb. per acre is particularly beneficial to peaty soil, heavy clayey soil, and to land in which heavy crops of green manures have been ploughed under. The lime does not require to be buried deep, but is generally applied as a surface dressing, slightly harrowed in, as the lime has a natural tendency to sink into the ground.

Calcium carbonate, $CaCO_3$, *carbonate of lime, limestone, chalk, marble*, is a lime salt, widely distributed, forming in many localities whole mountains. It is also the chief constituent of corals, egg-shells, and the shells found on the sea shore. Calcium carbonate is only very slightly soluble in water, but becomes

more soluble in water containing carbonic acid, due to the formation of bicarbonate, as already explained in an earlier lesson.

Carbonate of lime, *mild lime*, is frequently applied to land in the form of shell sand and coral sand, and also as *marl*, a sandy clay found in many localities and containing variable amounts of lime. A dressing of mild lime in preference to quicklime is to be recommended on light soils, soils deficient in vegetable matter, and as a top-dressing to sour and coarse grass lands. Certain marls form, when calcined or burnt, and the mass ground to a fine powder, *hydraulic mortars* or *cements*, which, after mixing with water, harden in a very short time. *Concrete* is a mixture of hydraulic cement, sand, and small gravel.

Calcium sulphate, $CaSO_4$, or *sulphate of lime*, is found in Nature as *gypsum* and *alabaster*, $CaSO_4.2H_2O$, containing two molecules of water of crystallisation. Gypsum is slightly soluble in water—1 part in 400 parts of water—but the solubility is increased by the presence of other salts, particularly common salt. When heated to about 160 degrees C., gypsum loses most of its water of crystallisation and forms a white powder, *plaster of Paris*, which when mixed with water sets hard by recombining with water (*Experiment 61*).

Gypsum is occasionally used as a manure, forming a good top-dressing for clover and other leguminous crops. It is also used in the formation of manure and compost heaps to prevent loss of ammonia.

Calcium silicates are found in combination with other silicates in a great number of minerals, and they also form part of the composition of most glasses. *Common window glass* is a mixture of sodium and calcium silicate; *Crown glass* or *Bohemian glass* is a mixture of potassium and calcium silicate, which does not fuse so readily as the soda glass.

Window glass is prepared by fusing a mixture of quartz sand, chalk, and soda ash. Cheap qualities of glass are more or less coloured, due to the presence of impurities.

Calcium phosphates: Tricalcium phosphate, $Ca_3(PO_4)_2$, is the *normal phosphate* found in Nature in the minerals apatite, phosphorite, and coprolites, in guano, in bones, in the seeds of the cereals, and in minute quantities in most soils. It is a whitish earthy substance, insoluble in water, but soluble in mineral acids. By treating the normal phosphates—*bone phosphate, bone ash, guanos, mineral phosphate*—with acids they are *dissolved* and *superphosphates* produced. This solution takes also place in the soil in a slight degree with the aid of organic acids and the presence of alkali salts. The solubility depends largely on the physical condition of the phosphate, and is increased when the phosphates are ground very fine.

Dicalcium phosphate, $CaHPO_4$, *precipitated phosphate*, is, as the name indicates, prepared by precipitation of solutions containing phosphoric acid with lime. Refuse of the manufacture of glue from bones is treated with hydrochloric acid, and the liquid treated with milk of lime (*Experiment 62*). This precipitate phosphate is more soluble than the normal phosphate, more particularly in water containing ammonium citrate in solution (*Experiment 63*). By allowing precipitated phosphate to stand with an excess of lime it will be changed gradually into normal phosphate (*Experiment 64*). On account of its greater solubility, precipitated phosphate is of greater value as a phosphatic manure than the normal phosphate. In a soil containing a large amount of lime this change into the insoluble phosphate will also take place very quickly.

Monocalcium phosphate, $CaH_4(PO_4)_2$, or *superphosphate*, is obtained by the dissolving of normal phosphate with sulphuric acid. Sulphuric acid must not be added in excess, but to leave some of the calcium combined with the phosphoric acid, according to the formula—

$$Ca_3(PO_4)_2 + 2H_2SO_4 = 2CaSO_4 + H_4Ca(PO_4)_2.$$

The other impurities of the mineral phosphates treated in the manufacture of superphosphate are also acted upon by the sulphuric acid and other lime salts, and metallic oxides are changed into sulphates, so that commercial superphosphates are mixtures consisting chiefly of calcium sulphate or gypsum, monocalcium phosphate, other sulphates, and some undissolved normal phosphate.

A very pure superphosphate may be obtained for experimental purposes by adding a dilute phosphoric acid solution slowly to lime water until a slight turbidity is produced. The filtered clear solution is almost pure monocalcium phosphate—

$$Ca(OH)_2 + 2H_3PO_4 = CaH_4(PO_4)_2 + 2H_2O$$

(*Experiment 65*). A solution of the nearly pure salt is also obtained by treating superphosphate with water and filtering the solution. The clear liquid has a slightly sour taste and reaction. Superphosphates on keeping show an increase in the amounts of insoluble phosphates, which are called *retrograde* or *reverted phosphate.* The process of reverting is a complicated chemical interaction under formation of dicalcium phosphate and other insoluble phosphates, chiefly iron and aluminium phosphates.

Tetracalcium phosphate, $Ca_4P_2O_9$ or $CaO.Ca_3(PO_4)_2$, *basic slag* or *Thomas phosphate,* resembles in its properties the dicalcium phosphate in being insoluble in pure water but soluble in saline solutions, particularly solutions of salts of citric acid, and for this reason phosphoric acid in this form is called *citrate soluble phosphoric acid,* to distinguish it from the *water soluble phosphoric acid* in superphosphate and the *insoluble phosphoric acid* of the normal phosphates. Basic slag is one of the cheapest and best sources for the supply of phosphoric acid to plants. Thomas phosphate is a by-product in the manufacture of steel from pig-iron in the Bessemer process, modified by Thomas and Gilchrist. Thomas slag is produced in large quantities of 1,500,000 tons annually, and its great success as a manure led to the manufacture of an artificial basic slag. The value of the slag as a manure depends largely on its fineness, and a good sample of Thomas phosphate should nearly all pass through a sieve having 100 meshes to the linear inch.

Analytical Tests for Calcium.—The flame is coloured reddish-yellow by a lime salt. With ammonium oxalate lime salts give a white precipitate of calcium oxalate, soluble in hydrochloric acid, but insoluble in acetic acid (*Experiment 66*).

Magnesium, Mg.—Like calcium, this element is found widely distributed in the mineral, vegetable, and animal world, though less abundantly. Of the minerals silicates of magnesia, as *Steatite* or *French chalk*, *Asbestos*, and *Meerschaum*, are of importance. The carbonate is found in the mineral *Magnesite* and mixed with lime in the mineral *Dolomite.* The sulphate and chloride are found in sea water and many mineral waters. Metallic magnesium is a silver-white metal, which burns with a dazzling white flame (*magnesium light*), forming **Magnesium oxide,** or *magnesia*, a white, very light powder, nearly insoluble in water (*Experiment 67*).

Magnesium sulphate, $MgSO_4.7H_2O$, *Epsom salts* or *salts*, is found as a mineral in salt mines. It is easily soluble in water, the solution having a peculiar bitter taste. Magnesium sulphate is used in medicine as an aperient.

Magnesium chloride, $MgCl_2$, is found in minerals, in sea water, and many spring waters. Waters containing magnesium chloride are dangerous to use for steam boilers, as this salt decomposes when heated with water, setting free hydrochloric acid, which will attack the iron boiler plates.

Magnesium phosphates resemble closely the calcium phosphates. A double salt with ammonia, *Ammonium magnesium phosphate*, $Mg(NH_4)PO_4$, is used for the determination of magnesia in its compounds. On the addition of sodium phosphate solution to a solution of magnesium salt in presence of ammonia gives a white crystalline precipitate—

$$MgSO_4 + NH_3 + HNa_2PO_4 = Na_2SO_4 + Mg.NH_4.PO_4$$

(*Experiment 68*).

Magnesia is always found in plant ashes, although generally in smaller quantities than lime, and it seems indispensable to plant life. Red clover, tobacco, and sugar-beets take large amount of magnesia from the soil, but as most of our soils contain a sufficient amount of magnesium salts a supply of

them as manure is rarely required. Magnesia seems to assist in the starch-forming processes, in the development of chlorophyl, and is necessary for healthy growth and colour. Grape vines flourish better in soils rich in magnesia, and applications of manures containing magnesia have been found beneficial for oats, potatoes, clover, and corn.

Aluminium, Al.—This element is very widely distributed over the earth, and exists in great abundance in the mineral world, nearly 8 per cent. of the crust of our earth being aluminium. It is a silver-white metal, which, on account of its lightness—being only $2\frac{1}{2}$ times heavier than water—and its ductibility, is largely used. With copper it forms an alloy, *aluminium bronze*, closely resembling gold, and nearly as strong as iron.

Aluminium oxide, Al_2O_3.—*Alumina* exists in Nature in the form of exceedingly hard minerals—*corundum*, *ruby*, and *sapphire*. An impure variety of corundum is used as *emery powder* for knife polish.

Aluminium hydroxide, $Al_2(OH)_6$, is also found as mineral, and is obtained as a white gelatinous precipitate on the addition of ammonia to an aluminium salt. This precipitate is soluble in acids, and also in potash and soda (*Experiment 69*). This compound has great attraction for certain colouring matters, forming insoluble compounds called *lakes*, and for this reason alumina is used in dyeing and calico printing for fixing the colour on to the fabric.

Aluminium sulphate, $Al_2(SO_3)_2$, forms with other sulphates the double salts called **Alum**, which are used extensively in many arts—as, for instance, paper-making, dyeing, calico printing, and in manufacture of colours, &c.

Potash Alum, $KAl(SO_4)_2.12H_2O$.

Ammonia Alum, $NH_4.Al(SO_4)_2.12H_2O$.

Alums are colourless crystals, soluble in water, the solutions having acid reactions and peculiar astringent taste. When heated the crystals melt and lose their water.

Aluminium silicates form important double salts with silicates of other metals, which are all minerals of importance.

Water free aluminium double silicates are the **Felspars** in which aluminium silicate is mixed with silicate of potash, soda, lime, magnesia, and traces of iron. The most important is *potash felspar* (*Orthoclase*), $K_2O.Al_2O_3.6SiO_2$. Others are soda and lime felspars. Felspars are insoluble in water, but are slowly decomposed and dissolved by water containing weak acids and salts of alkalies and alkaline earths in solution. **Granite**, which is one of the oldest rocks, forming the solid structure of our earth, contains *quartz*, the transparent grains; *felspar*, the dull, slightly coloured grains and finally glittering scales of *mica*, which is also a double silicate of potash and alumina, in which, however, frequently the potash is replaced by magnesia. Minerals formed by partial decomposition of felspars are *hydrated double silicates*, *Zeolithes*. By the continual action of moist air containing carbonic acid and by water, granites are slowly disintegrated. The carbonic acid removes the alkalies and alkaline earths, and leaves a pure *aluminium silicate*, **Kaolin**, or *clay*, which is frequently washed away from the heavier quartz and deposited in other places.

Clay consists chiefly of aluminium silicate mixed with some silica, and varying amounts of lime, iron oxide. *Loam* is a still more impure variety of clay. Other aluminium silicates are slate, pumicestone, fuller's earth, and marl, which contains a considerable amount of carbonate of lime.

Porcelain is made from a mixture of kaolin, quartz sand, and felspar; ordinary *stoneware* is made from less pure materials.

Bricks are made from clay mixed with sand. Aluminium does not seem necessary to plant life, and, although so widely distributed in Nature, is only rarely and in small quantities found in plant ashes. In some of the lower plants, particularly lichens, alumina is frequently found in the ash.

The element **Boron** = B, which belongs to the group of earthy metals, is of interest to us, because its compounds, **Boric acid** $B(OH)_3$, or *boracic acid*, and the soda salt, **Borax**, $Na_2B_4O_7$, are used as preservatives.

APPENDIX TO EIGHTH LESSON.

The other elements belonging to the group of alkaline earths, Barium and Strontium, are never found in plant life. *Barium salts* give a bright green colour to the flame, and *Strontium salts* a brilliant red. Barium salts are very heavy and poisonous. *Magnesium,* although belonging to this group of metals, resembles more the metal Zinc.

Not all iron salts in the ground are injurious to plant life, only the lower oxidised form of *ferrous salts* can do harm. Our red volcanic soils contain large amounts of iron, all in the *ferric* state.

Experiment 57.—Show the effects of adding water to quicklime.

Experiment 58.—Prepare lime water by putting a few small lumps of quicklime into a bottle, and fill up with water, shaking slightly from time to time. As the lime subsides the water above is quite clear, but contains some of the lime in solution. This water may be drawn off for use, and the bottle filled up with water again as long as there remains some hydroxide at the bottom. The bottle must be shaken occasionally, and must be tightly corked.

Experiment 59.—Dissolve a few crystals of *ferrous sulphate*, or green vitriol, in a test tube half filled with water and add a few drops of lime water; a dark-coloured precipitate of ferrous oxide will at once be formed.

Experiment 60.—Make clayey water by rubbing some clayey soil with water; after settling, fill two test tubes with the muddy-looking liquid. To one add a few drops of lime water and allow to stand for an hour. In the tube in which the lime was added the water will become almost clear.

Experiment 61.—Heat gypsum crystals on a piece of platinum foil or in a glass tube; note how crystals become more opaque, lose water, and finally crumble into a white powder, which, when mixed with water, will again set hard.

Experiment 62.—Dissolve bone ash with hydrochloric acid and filter the liquid, or dissolve superphosphate with water and filter; both solutions contain phosphoric acid which, on addition of lime water, forms a precipitate.

Experiment 63.—Collect some of the precipitate in a test tube and add ammonium citrate solution, prepared by neutralising a solution of citric acid with ammonia; on shaking, the precipitate will be dissolved.

Experiment 64.—Take another portion of the precipitate and add some lime water to it, and allow to stand for a week, shaking occasionally. Then add ammonium citrate, and you will find precipitate has become insoluble.

Experiment 65.—Prepare some superphosphate by treating bone ash with sulphuric acid, and also by adding a solution of phosphoric acid to lime water as described. Show that an addition of milk of lime will produce an insoluble phosphate.

Experiment 66.—Show the flame test of calcium by introducing a small amount of calcium chloride into the blow-pipe flame; also add ammonium oxatate to a solution of calcium chloride to get lime oxatate.

Experiment 67.—Burn a piece of magnesium wire, and collect the oxide formed; show its slight alkaline character with litmus paper.

Experiment 68.—Prepare a solution of magnesium sulphate; show the precipitate of the hydroxide formed with ammonia if ammonium chloride was added previously. Show also the precipitation with sodium phosphate in presence of ammonia.

Experiment 69.—Make a solution of alum; add ammonia in slight excess. The precipitate of alumina will be soluble in potash and in acids. To another portion add potash; the precipitate first formed will dissolve if potash is added in excess.

QUESTIONS TO EIGHTH LESSON.

1. How is quicklime obtained?
2. What happens when quicklime is left exposed to the air?
3. What is the difference between ordinary and hydraulic mortar?
4. What soils will benefit by a dressing with quicklime?
5. What important action has lime on soil?
6. What is plaster of Paris?
7. Which are the different phosphates of lime?
8. Explain the difference between water soluble, citric soluble, and insoluble phosphoric acid in manures.
9. Why must lime never be mixed with superphosphate?
10. What value has lime as a plant food?
11. What is Epsom salt?
12. Is magnesium a necessary plant food?
13. Is aluminium a necessary plant food?
14. What is the composition of granite?
15. How does granite decompose exposed to the air?
16. Enumerate a few of the most important aluminium silicates.
17. What are alums?
18. What is borax?

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1905.												1906.
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
North.													
Bowen	22·69	0·50	1·17	5·72	0·74	0·53	0·39	0·06	4·03	0·05	3·91	0·04	12·84
Cairns	25·74	8·59	6·81	6·92	3·89	1·94	0·43	2·27	Nil	0·46	1·72	0·53	6·99
Geraldton	28·37	5·71	8·26	20·51	13·35	9·39	2·41	3·88	Nil	0·22	5·44	1·14	15·61
Herberton	7·39	3·37	0·75	2·41	2·67	1·17	0·05	0·89	Nil	0·21	1·69	0·51	15·20
Hughenden	3·37	0·07	0·70	3·84	Nil	0·41	0·47	Nil	Nil	0·13	0·07	0·14	6·11
Kamerunga	29·08	7·56	4·38	8·89	5·63	2·59	1·11	2·16	Nil	0·63	1·05	0·33	7·25
Longreach	1·17	0·53	0·17	2·41	Nil	Nil	0·22	Nil	Nil	0·06	0·77	0·17	3·99
Lucinda	15·40	1·68	2·79	23·06	3·15	1·92	4·14	0·89	0·15	0·68	2·03	0·95	10·13
Mackay	29·89	4 73	3·67	13·19	2·17	1·82	0·95	0·66	0·97	0·08	2·45	0·70	13·58
Rockhampton	15·39	0·92	0·09	8·93	0·95	0·54	0·26	0·51	0·70	0·91	1·05	4·77	4·24
Townsville	13·71	1·97	2·02	6·41	0·52	0·35	0·68	0·06	...	0·52	0·19	Nil	7·30
South.													
Barcaldine	1·85	0·12	0·25	1·56	Nil	Nil	0·30	0·04	Nil	0·15	1·49	1·30	4·00
Beenleigh	5·44	3·04	2·91	3·63	2·21	0·40	0·27	1·12	1·15	2·82	1·76	3·77	4·96
Biggenden	13·05	1·94	3·61	3·81	1·46	0·60	0·28	0·10	0·79	2·56	1·14	11·66	2·27
Blackall	3·19	0·23	2·34	5·02	0·21	Nil	0·68	0·04	Nil	0·29	1·45	0·83	5·13
Brisbane	9·09	2·64	2·65	4·50	1·10	0·39	0·28	0·65	1·32	2·22	3·63	8·21	4·16
Bundaberg	16·67	2·17	3·35	6·31	4·26	1·10	0·71	0·17	0·95	2·37	0·95	6·74	6·92
Caboolture	8·10	3·43	3·57	4·89	1·65	0·26	0·05	0·36	0·98	2·73	2·88	6·72	8·11
Charleville	1·70	0·73	1·67	3·87	0·63	0·01	0·15	0·14	0·09	0·99	0·68	0·12	1·29
Dalby	3·40	0·74	5·46	3·09	2·19	0·25	1·15	0·76	0·14	2·09	1·60	5·67	4·15
Emerald	7·77	0·25	1·76	6·00	0·72	0·06	0·50	0·30	0·29	0·64	4·41	0·80	6·12
Esk	8·26	0·85	1·87	3·52	1·68	0·33	0·52	0·57	0·65	3·21	3·65	5·98	5·49
Gatton College	5·57	1·10	1·71	4·22	2·56	0·26	0·98	0·27	0·54	2·59	3·59	4·73	3·75
Gayndah	11·34	0·82	1·58	4·06	1·07	0·42	0·54	0·25	0·30	2·38	1·52	5·58	2·81
Gindie	7·07	0·06	1·74	7·44	0·41	0·11	0·37	0·09	Nil	1·11	3·79	Nil	1·92
Goondiwindi	3·37	0·87	2·53	6·49	1·23	0·55	0·52	0·58	Nil	3·57	1·51	2·72	1·08
Gympie	9·75	2·29	2·00	7·05	4·49	0·79	0·78	0·70	1·85	1·48	1·44	5·03	6·06
Ipswich	6·87	1·30	1·85	2·86	1·98	0·50	0·44	0·78	0·70	2·91	3·32	3·64	5·30
Laidley	9·93	2·33	2·17	4·11	2·59	0·56	0·56	0·61	0·30	2·36	3·59	3·73	3·29
Maryborough	20·69	2·67	2·78	3·48	3·56	1·21	0·07	0·26	1·04	2·48	0·70	4·03	4·46
Nambour	13·50	5·38	3·58	6·65	4·79	1·36	0·05	0·83	1·62	4·70	0·85	5·37	7·01
Nerang	4·95	4·99	5·61	8·98	3·63	0·61	0·27	1·55	1·04	4·59	2·21	5·14	5·01
Roma	2·65	1·74	1·44	2·92	1·72	0·21	0·35	0·31	0·15	1·02	2·15	2·62	2·18
Stanthorpe	3·04	0·37	5·29	2·64	1·63	1·01	0·63	1·77	0·28	3·48	1·94	4·43	6·06
Tambo	3·54	1·34	2·54	5·12	0·12	0·06	0·36	0·46	Nil	0·85	1·57	0·39	5·09
Taroom	3·25	1·63	2·73	6·17	2·22	0·33	0·67	0·31	Nil	0·76	1·11	2·52	1·86
Tewantin	11·79	2·91	3·64	12·43	10·01	2·06	0·22	0·55	1·29	6·57	1·28	6·64	12·07
Texas	3·77	0·09	2·47	3·78	3·07	0·80	0·53	1·09	0·16	3·54	0·94	4·54	3·41
Toowoomba	4·50	1·91	4·17	5·27	3·69	0·65	1·01	0·66	0·61	2·59	2·09	3·20	6·17
Warwick	1·52	1·28	6·20	2·06	2·18	0·77	0·26	1·01	0·41	4·00	2·16	3·98	2·09
Westbrook	2·46	0·57	2·00	1·24	2·54	0·46	0·71	0·61	1·23	2·60	3·62	2·39	5·00

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Sales of butter have been made lately at prices much below last month's quotation. But prices are hardening, and there is every prospect of their ruling fairly high. Danish was sold during February at 124s. per cwt.

CHEESE.—Canadian, 62s. to 65s.; New Zealand, 61s. to 63s. per cwt.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £18 to £19; raw, £17 to £17 10s. per ton; German beet, 88 per cent., 8s. per cwt.

MOLASSES (duty, 1s. to 2s. per cwt.; for agricultural purposes only, duty free).—5s. to 9s. per cwt.

RICE.—Real Carolina, £24 to £28; Rangoon, £8 to £9 10s.; Japan, £15 to £15 15s.; Java, £17 to £20; Patna, £15 to £17 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 55s. to 110s.; peaberry, 50s. to 105s.; Santos, 40s. to 57s.; Jamaica, 110s. to 130s. per cwt.

CHICORY ROOT, DRIED (duty paid).—24s. to 25s. per cwt.

ARROWROOT.—St. Vincent, 1¾d. to 3½d.; Natal, 3d. to 4½d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

WHEAT.—Duluth, 33s. 6d. to 34s. 6d. per 496 lb.; English, 33s. to 33s. 6d. per 504 lb.; Australian, 31s. 1½d. to 31s. 3d. per 480 lb.; March shipment and loading on spot, 34s. 6d.

MALTING BARLEY.—28s. to 34s. per 448 lb.; grinding, 18s. 9d. to 26s. per 416 lb.

OATS.—New Zealand, 16s. to 24s. per 384 lb.

SPLIT PEAS.—40s. to 50s. per 504 lb.

GINGER.—Jamaica, 60s. to 65s.; Cochin, 42s. to 75s.; Japan, 19s. to 20s. per cwt.

VANILLA.—3s. 9d. to 7s. 6d., 7 to 7½ in.

PEPPER.—Capsicums, 14s. to 60s.; chillies, 33s. to 37s. per cwt.; black, 5⅝d.; white, 7½d. per lb.

RUBBER.—3s. 10d. to 5s. 4d.; Ceylon "biscuits," 6s. 4d. per lb.

GREEN FRUIT.—Apples: Australian, no quotation; American, 25s. to 32s.; Canadian, 20s. to 22s. per case; bananas, per bunch, s. to s.; pineapples, 2s. d. to 5s. each. Oranges, Valencia, per 420, common, 7s. to 8s.; medium, 9s. to 10s.; fine selected, 15s. to 20s.; finest selected, 22s. to 42s. Lemons, Naples, per 360, ordinary to fine, 12s. to 14s. Grapes, 12s. to 26s. per barrel.

DATES.—Tafilat, 67s. to 75s.; Egyptian, 27s. to 28s. per cwt.; Persian, 10s. to 12s. per case.

COTTON.—Uplands, 6½d.; Sea Island, 13d.; extra fine, 15½d. per lb.

COTTON SEED.—£5 to £5 10s. per ton.

COTTON-SEED OIL.—Crude, £16; refined, £17 10s. to £19 per ton.

COTTON-SEED OIL CAKE.—£4 17s. 6d. to £4 18s. 9d. per ton.

COTTON WASTE.—In 5-cwt. bag bales, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

LINSEED.—42s. per qr.

LINSEED OIL.—£19 to £19 15s. per ton (1s. 11¼d. per gallon).

LINSEED OIL CAKE.—£8 10s. to £8 15s. per ton.

OLIVE OIL.—£37 to £41 per tun (252 gallons).

COPRA (cocoanut-kernel).—£17 7s. 6d. per ton.

COCOANUT OIL.—£34 per ton.

BEESWAX.—Australian, £7 10s. to £8 per cwt.

LUCERNE SEED.—60s. to 68s. per cwt.

CANARY SEED.—68s. to 84s. per quarter of 480 lb. = 8s. 6d. to 10s. 6d. per bushel.

HONEY.—17s. to 26s. 6d. per cwt.

MANILA HEMP.—£43 14s. per ton for best

SISAL HEMP.—£40 15s. 5d. per ton for best.

NEW ZEALAND HEMP.—£37 13s. 7d. per ton for best.

FOURCROYA (Mauritius Hemp).—£35 4s. 2d. per ton for best.

SANSIVIERIA HEMP.—Dark, £35; bright, £40 per ton.

DIVI DIVI.—£6 10s. per ton.

TAPIOCA (duty, 5d. per cwt.).—1½d. to 2d. per lb.; pearl, 12s. to 18s. per cwt. Latest advices quote tapioca at greatly advanced prices; as much as £5 per ton advance is asked.

EGGS.—French, 11s. to 17s.; Danish, 10s. to 15s. 3d. per 120.

BACON.—Irish, 64s. to 80s.; American, 44s. to 50s.; Canadian, 50s. to 57s. per cwt.

HAMS.—Irish, 86s. to 120s.; American, 46s. to 52s. per cwt.

PORK (frozen).—5½d. per lb.

TALLOW.—Mutton, fine, 33s.; medium, 28s.; beef, fine, 29s. 6d.; medium, 27s. per cwt.

Poultry (Smithfield).—Supply good, trade good. Prices: Surrey fowls, 3s. to 4s. 6d.; Lincolnshire fowls, 2s. 6d. to 3s. 3d.; Essex fowls, 2s. 6d. to 3s. 6d.; Irish fowls, 2s. to 2s. 6d.; feathered pigeons, 9d.; Bordeaux pigeons, 1s. to 1s. 4d.; geese, 5s. to 6s.; ducks, 3s. 3d. to 3s. 6d.; English hares, 3s. to 3s. 6d.; leverets, 2s.; wild rabbits, 9d. to 10d. each; Australian rabbits, 12s. 6d. to 13s. per crate.

Frozen Meat.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.
(Crossbred Wethers and Merino Ewes.)

	Feb. 10.	Feb. 17.
Canterbury, light (48 lb. to 56 lb.)	$4\frac{1}{4}$d.	$4\frac{1}{4}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
Canterbury, heavy (64 lb. to 72 lb.)	4d.	4d.
Dunedin and Southland (56 lb. to 64 lb.)	None offering.	
North Island (56 lb. to 65 lb.), ordinary	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
North Island, best	4d.	4d.

Australian Sheep.
(Crossbred and Merino Ewes.)

Heavy (over 50 lb.)	$2\frac{3}{4}$d.	$2\frac{3}{4}$d.
Light (under 50 lb.)	$3\frac{1}{8}$d.	$3\frac{1}{8}$d.

River Plate Sheep.
(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	3d.	3d.
Light (under 50 lb.)	$3\frac{1}{4}$d.	$3\frac{1}{4}$d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36 lb.)	$4\frac{1}{4}$d.	$4\frac{1}{4}$d.
Canterbury, heavy (36 lb. to 42 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
Dunedin and Southland (28 lb. to 42 lb.)	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
North Island (28 lb. to 42 lb.) ...	None offering.	

Australian Lambs.

30 lb. to 40 lb., first quality ...	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
30 lb. to 40 lb., second quality ...	$3\frac{3}{8}$d.	$3\frac{1}{2}$d.

River Plate Lambs.

30 lb. to 40 lb.	None offering.	

New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.) ...	$2\frac{3}{4}$d.	$2\frac{3}{4}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{1}{4}$d.	$3\frac{1}{4}$d.

(Quotations are nominal.)

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (180 lb. to 220 lb.) ...	3d.	3d.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.) ...	$2\frac{3}{8}$d.	$2\frac{3}{8}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{3}{4}$d.	$2\frac{3}{4}$d.

Queensland Timber.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the English market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand. Ivory wood should be carefully preserved from destruction.

General Notes.

QUEENSLAND AGRICULTURAL COLLEGE OLD BOYS' UNION.

AN EX-STUDENT ON THE BLACKALL RANGE.

Following is a very interesting but too brief an account of the experiences of one of the successful ex-students of the College, who writes under the significant *nom de plume*, "Orange Blossom." Our young friend concludes his notes by calling upon all the old students to take advantage of the privilege granted to them of the exclusive right to two or three pages of each issue of the Journal, to let the world know what they are doing in the way of profiting by their three years' course at the College, and to show that they have not drifted back to the towns, to high collars, bicycles, seven hours a day, and £50 per annum, but are working hard on the land to eventually make an honourable independence for themselves. The ex-students on the land are a living proof that the College amply justifies the expense of its upkeep. Our correspondent says:—

"How I came to the Blackall is a mystery, but, being here, I certainly intend to remain and work out my destiny, as I consider it as fine a place as any in Queensland for a young fellow to make a start in. The locality is very healthy—1,200 feet above sea-level—with splendid soil, good rainfall, and a fine lot of progressive neighbours setting an example to spur a man on to show that the College training has done some good.

"Although this (Montville) is only a young settlement, we have, within a radius of 5 miles, some forty or fifty families; and when I say that over a dozen of the orchards are scarcely old enough to send away a single case of fruit, it can easily be understood that those ranging from four to nine years old must bear splendid crops to be able to send away, as they do, over 30,000 cases of citrus fruits annually. Most of the trees are 'worked'—that is, budded trees—but there are many seedlings fruiting. For myself, I prefer the worked tree as an all-round bearer. The trees are planted in rows from 20 to 25 feet apart each way, but the average is 25 feet apart, which gives 86 trees to the acre. As the land is all hill and dale it does not do to cultivate between the trees after November and on to May or June. All we do in that period is to keep a circle clean round the trees and mow down the weeds on the rest of the land to keep them from seeding. This serves a double purpose by preventing the washaway of the soil, and providing a good mulch on the ground, which acts as good manure when ploughed in in the winter. In common with those employed in other branches of agriculture, we are troubled with fruit pests, the worst being red scale, white louse, borers, bark fungus, and orange bugs.*

"An important aid to the destruction of the orange bug is a bird commonly known as the 'fish tail.' This bird destroys large quantities of the bug. I must say I admire its taste. Thank goodness! we are not troubled here with the small boy and his pea-rifle. If he should make his hateful appearance here, his gun will be reckoned amongst the 'have beens.'

"Strawberries and pineapples thrive well here, although of late the former have not been considered so good an investment as the Standard Oil Trust or Queen Cross. Still, with proper rainfall the strawberry bears heavily and yields splendid fruit. I have seen berries here of which only sixteen make a quart.

* "Orange Blossom" describes the injuries inflicted on orange-trees by these pests; but we need not refer to them here, as they are well known through the writings of Mr. A. H. Benson, and will be ably dealt with by him in his forthcoming pamphlet on Fruit Culture.—Ed. Q.A.J.

"As to the pineapples, both smooth and rough-leaved, they grow to a large size; often only eight go to a case. Peas, beans, and all sorts of vegetables grow to perfection, and, if we only had better roads, Montville would soon become Queensland's vegetable garden.

"Talking about large fruit reminds me that 'Washington Navel' oranges very often grow to such a large size here that only three dozen can be got into a case measuring 24 x 12 x 8 inches, outside measurement. I have also seen three oranges picked off a five-year-old tree weighing respectively 13¼, 15, and 17¼ oz.

"At present we are trying to improve our roads by grading, &c., and hope soon to see a good lot of men and plenty of money employed in this necessary work. We also have telephonic communication in view, besides other up-to-date conveniences."

This is the kind of letter we like to receive from the ex-students—a letter which not only records their own doings, but which gives a fair idea of what others are doing, and how the various districts are progressing. If future contributors will write on similar lines, we shall have a record in the Journal for generations to come of the trials and struggles and triumphs over initial difficulties of the pioneers of Queensland industries all over the State.

WATER-CRESS.

Water-cress may be successfully grown on ordinary garden soil without the aid of running water. When water is laid on from pipes water-cress will thrive as well as in a running stream. To cultivate on ordinary soil, prepare a bed of good mould about 6 inches deep. Smooth and water it in the evening, and next day reduce the soil to a fine tilth. Mix the seed with fine sand, and sow as evenly as possible, and cover very lightly with a thin layer of mould. Press the seed down, water, and cover with matting. When the seed has sprouted, replace the matting with a shade of branches, and keep the soil quite moist. The plants soon grow; by and by they flower, when a new covering of mould is given them, leaving the plants about 1 inch above ground. Then water freely. Ten days later shoots will appear springing from the roots, which, when 2 or 3 inches high, are removed, and pricked out 3 or 4 inches apart in a new bed. A fortnight later the cress will be 6 inches high, when cropping may begin and continue right up to the first frosts, cutting every fortnight. Care must be taken to give copious waterings every evening. The seed should be sown in spring.

THE AGRICULTURAL JOURNAL OF INDIA.

The importance of spreading general and special information on agricultural subjects amongst those engaged in rural occupations is now generally recognised by the Governments of all British States and colonies. Nearly all issue an official agricultural journal, which is greatly appreciated not only locally but in neighbouring and more distant States. The latest addition to these official journals, "The Agricultural Journal of India," has just reached us. The first number was issued on 1st January, 1906, and it is proposed to issue it quarterly each year. The publication, which is edited by the Inspector-General of Agriculture in India and an Advisory Committee of the staff of the Agricultural Research Institute, contains a variety of valuable information on agricultural subjects, some of which are applicable to Queensland as well as to India. The articles will not be exclusively the work of the Government agricultural officers, but officers of other departments and also private workers will be invited to contribute from their stores of information. The first number, which is beautifully illustrated and clearly printed, contains useful information on "Wilt Disease of Pigeon Pea and Pepper," "Manuring Sugar-cane," "Insect Pests of Cotton," "Orange Cultivation," "The Study of Fermentation as applied to Agriculture," besides useful short notes on a variety of subjects, on a plan similar to the General Notes published in the "Queensland Agricultural Journal."

HOW TO UTILISE FOWL MANURE.

Great care is needed in applying the scrapings of fowlhouses to plants, as it is a very powerful material, composed of soluble urate, carbonate and sulphate of ammonia, also soluble. The insoluble constituents contain calcium phosphate and magnesium phosphate. Instead of applying this fertiliser in its undiluted state, it should be mixed with ashes, dead leaves, or other vegetable matter decomposed, lime, dry earth, &c. It may also be mixed with farmyard manure. It is in itself richer than any other manure produced on the farm. As compared with horse manure, it contains in 1 ton 43 lb. nitrogen as ammonia, 19 lb. potash, 58 lb. lime, and 39 lb. phosphoric acid; whereas the figures for horse manure are 17 lb., 13 lb., 10 lb., and 9 lb. respectively. Air-dried hen manure is worth from £1 14s. to £2 2s. per ton of 2,000 lb. Every fowl will produce 6d. worth of high-class manure, so that the owner of 100 fowls can save as much as would buy half a ton of superphosphate. If liquid manure is required, mix 3 bushels of soil, 2 bushels of fowl manure, 1 bushel of ashes. Use 1 lb. of this mixture to 4 gallons of water.

DRESSING FLAX WITHOUT SCUTCHING.

From the "Auckland Herald" we learn that a gentleman at Taranaki has invented a process of producing clean flax without the intervention of the scutching machine. The flax plants are subjected to the operation of a high-pressure water jet, which breaks up the epidermis, washes away all vegetable tissue, and leaves the fibre absolutely clean and beautifully white. No bleaching is therefore required as under the usual process of paddocking. A point of great importance is that the fibre is not broken, consequently there is no loss in the shape of tow as with the present machines, and there are no tail ends wasted. If this process can be successfully and cheaply applied to New Zealand flax, it may be possible that other fibre plants, such as the sisal, *Musa textilis*, or Manila fibre, and the ordinary Queensland banana, can be treated in like manner, in which case thousands of tons of banana fibre could be obtained in this State.

EASY WASHING.

A correspondent of the "Farmers' Union Advocate," N.Z., vouches for the efficacy of a plan, well-known to many, for washing clothes perfectly without rubbing or soaking. Briefly it is this: Put 13½ gallons of water into a boiler. As soon as it boils, put into it three-quarters of an ounce of finely-shredded paraffin wax and three-quarters of a pound of finely-cut washing soap. When these are quite dissolved, but not before, put in the clothes dry just as they are. Then sit down and take a rest, or do something else for twenty minutes. At the end of that time your clothes are washed clean for you, and cleaner than by the old rubbing style. Wring out, and blue in the usual way. The water must be kept boiling all the twenty minutes.

If the above is correct, and the result as stated, we wonder why laundresses work so hard at rubbing clothes on a board.—Ed. Q.A.J.

WATERING PLANTS.

It is customary with amateur gardeners to wash the dust off garden plants by watering overhead. The idea is to clean the leaves, open the pores, and so give the poor plants a new lease of life. But this overhead watering is a great mistake. Mr. Jas. Biggs, in a paper read at the Adelaide School of Mines, said:—"When the flowers are out, care should be taken that too much water does not get on them, or they will be bleached by the sun, espicially if watering is done in the morning. At any time water on the flowers is not good. Give the plants water at the roots—as much as they will take up, and the tops will look after themselves. If annuals were, like vegetables, planted in rows, then a

small trench could be made with a hoe, and the water run down. This is one form of irrigation, another is to flood the whole surface. The trench should be open irrigation is done. This prevents the sun having the same power it otherfilled in when the water has soaked away, or the surface should be broken up if wise would on a flat surface; the sun's rays are more divided and less evaporation takes place. The more water you give plants the more they require. This is especially so with annuals. Take two of the same kind, stand one in water, and just keep the soil of the other moist; the one in the water will flag more in the sun than the other. They are like a man always soaking in beer—they get soft and flabby, and feel the heat more."

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Times of Sunrise and Sunset, 1906.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·58	6·46	5·22	6·42	5·42	6·19	5·59	5·46
2	4·58	6·46	5·22	6·42	5·43	6·18	5·59	5·45
3	4·59	6·46	5·23	6·41	5·43	6·17	6·0	5·44
4	5·0	6·46	5·24	6·41	5·44	6·16	6·0	5·43
5	5·1	6·47	5·24	6·40	5·44	6·15	6·0	5·42
6	5·2	6·47	5·25	6·40	5·45	6·14	6·1	5·41
7	5·2	6·47	5·26	6·39	5·45	6·13	6·1	5·40
8	5·3	6·47	5·27	6·38	5·46	6·12	6·2	5·39
9	5·3	6·47	5·28	6·37	5·46	6·11	6·2	5·38
10	5·4	6·48	5·28	6·36	5·47	6·10	6·3	5·37
11	5·4	6·48	5·29	6·35	5·47	6·8	6·3	5·36
12	5·5	6·47	5·30	6·35	5·48	6·7	6·4	5·35
13	5·6	6·47	5·31	6·34	5·49	6·6	6·4	5·34
14	5·7	6·47	5·32	6·34	5·50	6·5	6·5	5·33
15	5·8	6·47	5·32	6·33	5·50	6·4	6·5	5·32
16	5·9	6·46	5·33	6·32	5·51	6·3	6·6	5·31
17	5·10	6·46	5·34	6·31	5·51	6·2	6·6	5·30
18	5·11	6·46	5·34	6·30	5·52	6·1	6·7	5·29
19	5·11	6·46	5·35	6·29	5·52	6·0	6·7	5·28
20	5·12	6·46	5·36	6·28	5·53	5·58	6·8	5·27
21	5·12	6·46	5·36	6·27	5·53	5·57	6·8	5·26
22	5·13	6·46	5·37	6·26	5·54	5·56	6·9	5·25
23	5·14	6·45	5·38	6·25	5·54	5·55	6·9	5·24
24	5·15	6·45	5·39	6·24	5·55	5·54	6·10	5·23
25	5·16	6·44	5·40	6·23	5·55	5·53	6·10	5·22
26	5·17	6·44	5·40	6·22	5·56	5·52	6·11	5·21
27	5·18	6·44	5·41	6·21	5·56	5·51	6·11	5·20
28	5·19	6·43	5·41	6·20	5·57	5·50	6·12	5·19
29	5·20	6·43	...	...	5·57	5·49	6·13	5·18
30	5·20	6·42	...	...	5·58	5·48	6·13	5·17
31	5·21	6·42	...	...	5·58	5·47	...	...

Phases of the Moon.

			H. M.	
2 Jan.	☾	First Quarter	12 52	p.m.
10 ,,	○	Full Moon	2 36	,,
17 ,,	☽	Last Quarter	6 48	,,
24 ,,	●	New Moon	3 9	,,
1 Feb.	☾	First Quarter	10 30	a.m.
9 ,,	○	Full Moon	5 45	,,
16 ,,	☽	Last Quarter	2 22	,,
23 ,,	●	New Moon	5 57	,,
3 Mar.	☾	First Quarter	7 28	a.m.
10 ,,	○	Full Moon	6 17	p.m.
17 ,,	☽	Last Quarter	9 57	a.m.
24 ,,	●	New Moon	9 51	p.m.
2 April	☾	First Quarter	2 2	a.m.
9 ,,	○	Full Moon	4 12	,,
15 ,,	☽	Last Quarter	6 36	p.m.
23 ,,	●	New Moon	2 6	,,

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

	Rockhampton.		Townsville.		Cooktown.	
1906.	Rise.	Set.	Rise.	Set.	Rise.	Set.
January ...	18 m.	2 m.	42 m.	12 m.	53 m.	9 m.
February ...	15 m.	5 m.	36 m.	18 m.	44 m.	18 m.
March 1 to 20...	11 m.	9 m.	29 m.	25 m.	35 m.	27 m.
,, 21 to 31...	9 m.	11 m.	28 m.	26 m.	29 m.	33 m.
April ...	7 m.	13 m.	20 m.	34 m.	21 m.	41 m.

Answers to Correspondents.

PEACHES AND APPLES.

ARTIFICIAL, Charters Towers.—Mr. A. H. Benson, to whom your cuttings and letter were submitted, advises you to take no further trouble with your trees. He does not consider that either peaches or apples will do in your part of the State.

TOP-DRESSING LAWNS.

SOUR GRASS, Yandaran.—

1. Top-dress with mould and water with 1 oz. superphosphate, 1 oz. nitrate of soda, 1 oz. potash sulphate, dissolved in 4 gallons of water.

2. Give a good watering with this solution immediately after top-dressing, and a second watering when the grass appears above ground.

3. For the destruction of sour grass or sorrel, no chemical could be applied without injury to the grass. The roots of the weed must be taken out by hand.

DIFFICULTY IN REARING CALVES.

ENQUIRERS, Gayndah Line.—

Question.—We have experienced great difficulty in rearing our calves. They become suddenly sick when about three weeks old, and, although the symptoms are much the same, we believe it is not the scours owing to skim-milk feeding. It looks liks hereditary weakness, as all the calves affected are by the same bull. Two died after a few hours' sickness. The other two we managed to pull through by the use of salt. In one of the calves we found on opening it a leathery substance in the stomach—otherwise all the organs were in a healthy condition.

Answer.—Mr. A. H. Cory, M.R.C.V.S.L., advises: Strict attention must be paid to the cleanliness of the calfpens and yards, the posts, rails, &c., being limewashed at least once a week while the disease exists. Also attend to regular feeding in moderate quantities. When the calves are first observed to be sick, give them at once a dose of oil, half linseed (raw), half castor. Then give twice or thrice daily—

Salicylic acid	10 grains.
Subnitrate of bismuth	10 grains.
Chlorodyne	20 drops.
Water	2 or 3 oz.

ANGORA GOATS.

S. N. P. wishes to start Angora goat-keeping, and would be glad if any of our readers can give him any information concerning a book on the Angora goat by Schrerner, published probably by Longmans and Co., where it is to be obtained, and at what price. Perhaps some of our Angora goat-breeders can recommend a work on the subject.

COAL ASHES AS MANURE.

H. LANE, New Farm.—Coal ashes and flue dust, as a rule, have little or no value as manure.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	FEBRUARY. Prices.
Apples, Eating, per packer	2s. 6d. to 7s. 3d.
Apples, American, per packer	16s.
Apples, Cooking, per packer	3s. to 5s. 6d.
Apples, Local, per packer	3s. to 4s. 6d.
Apricots, quarter-case	2s. 6d. to 3s. 6d.
Bananas, per bunch	4d. to 10d.
Bananas, per dozen	2d.
Cherries, quarter-case	2s. 6d. to 7s. 6d.
Comquats, case	...
Lemons, per case, local	2s. 6d. to 5s.
Mangoes, half-case	1s. to 5s. 3d.
Oranges, per packer	...
Passion Fruit, quarter-case	9d. to 1s. 6d.
Papaw Apples, per case	3s.
Peaches, half gin case	1s. 6d. to 3s. 6d.
Peanuts, per lb.	3d.
Pineapples (rough leaf), per dozen	3d. to 1s.
Pineapples (smooth leaf), per dozen	2s. to 5s.
Plums, Imported, quarter-case	7s. to 8s.
Plums, Local, quarter-case	2s. 6d. to 4s. 6d.
Strawberries, per quart	...
Tomatoes, quarter-case	6d. to 2s. 3d.
Watermelons, per dozen	1s. to 2s.
Rockmelons, per dozen	6d. to 1s. 6d.

SOUTHERN FRUIT MARKET.

Bananas, Queensland, per case	12s. to 13s.
" " per bunch	2s. 6d. to 6s.
Lemons, per gin case	4s. to 8s.
Oranges, per double case	15s. to 17s.
" Washington Navels, per double case	16s. to 17s.
Pineapples, case	2s. to 6s.
" per double case	5s. to 6s.
Rockmelons, case	2s. 6d. to 3s.
Peaches, half-case	3s. to 8s.
Tomatoes, case	1s. 6d. to 2s. 6d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY.

Article.		FEBRUARY. Prices.
Bacon (Pineapple)	lb.	7d. to 8½d.
Barley, Malting	bush.	2s. 9d.
Bran	ton	£5
Butter, Factory	lb.	10¼d. to 10½d.
Chaff, Mixed	ton	£3 10s. to £3 12s. 6d.
Chaff, Oaten	,,	£4 2s. 6d. to £4 7s. 6d.
Chaff, Lucerne	,,	£3 to £3 15s.
Chaff, Wheaten	,,	£2 10s.
Cheese	lb.	5d. to 6d.
Flour	ton	£8 5s.
Hay, Oaten	,,	£5 2s. 6d. to £5 15s.
Hay, Lucerne	,,	£1 15s. to £2 2s. 6d.
Honey	lb.	1¼d. to 2d.
Maize	bush.	1s. 5d. to 1s. 5½d.
Oats	,,	2s. 8d. to 2s. 8½d.
Pollard	ton	£5 2s. 6d. to £5 7s. 6d.
Potatoes	,,	£6 4s. to £11.
Potatoes, Sweet	,,	£4 4s.
Pumpkins	,,	£1 to £1 10s.
Wheat, Milling	bush.	3s. 9d.
Wheat, Chick	,,	2s. 7½d. to 3s. 9¼d.
Onions	ton	£4 2s. 6d. to £5 3s.
Hams	lb.	9d. to 10½d.
Eggs	doz.	7½d. to 1s. 4½d.
Fowls	pair	1s. 7d. to 2s. 9d.
Geese	,,	4s. to 5s. 3d.
Ducks, English	,,	1s. 10½d. to 3s. 1d.
Ducks, Muscovy	,,	2s. 6½d. to 3s. 6d.
Turkeys, Hens	,,	...
Turkeys, Gobblers	,,	...

ENOGGERA SALES.

Animal.	JANUARY. Prices.
Bullocks	£9 10s. to £11 17s. 6d.
Cows	£6 15s. to £8 17s. 6d.
Merino Wethers	18s. 3d.
,, Ewes	15s.
C.B. Wethers	19s. 3d.
,, Ewes	18s.
Lambs	13s. 9d.
Pigs (very few)	...

Orchard Notes for April.

By ALBERT H. BENSON.

The Orchard Notes for March dealt largely with citrus fruits, especial attention being drawn to the importance of taking every precaution, now that the fruit is reaching maturity, for preventing its destruction by the various pests that attack the ripening fruit. At the same time, I pointed out the necessity for the proper handling, sweating, and packing of the fruits, in order that it shall be placed on the markets either of this or the other Australian States in the most attractive manner and best possible condition. All that I stated in last month's Notes applies with equal force to the present month, and in fact as long as the citrus season continues, so that I need not repeat what I then wrote, but will simply draw the attention of all citrus-growers to the importance of my remarks, as it is useless to take every care throughout the year to keep the trees well pruned and free from disease and the orchard in a high state of cultivation if we do not do our best to protect the result of such work and to market it to the best advantage.

With the exception of the marketing of citrus and a few other fruits—such as persimmons, pines, bananas, custard apples, &c.—April is a somewhat slack time for fruit-growers, especially those who depend on deciduous fruits, so that the opportunity should be taken to clean up the orchard before winter, and to finish up any odd jobs that have been neglected during the previous months. Such work will consist of looking after all fences, drains, headlands, &c.; the casting back of soil round trees where same has been washed away by the heavy summer rains; the ploughing in of all weeds and trash that have accumulated in the orchard during the west season; the removal of all dead or worthless varieties of trees that it is desirable to get rid of; and any other work—such as the collection of material for and making of compost heaps—that may be necessary.

Cyaniding for all kinds of scale insects may be continued during the month, taking care not to treat any trees bearing fruit when same is either wet with rain or heavy with dew, as, if treated under the conditions, the fruit is apt to be marked.

Strawberry-planting can be continued during the month, but the planting of all kinds of fruit trees should be delayed till the wood has been thoroughly matured. Keep the nursery clean, see that all young buds are growing properly, and that all unnecessary shoots are removed; the young tree being trained to one straight stem till high enough to form the future head of tree, when it should be topped.

Farm and Garden Notes for April.

Field.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay—April, May, and June at latest being the months for sowing. The main potato crop planted in February and March will now be ready for a first or second hilling up. The last of the maize crop will now have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking

should not be begun until the night dew has evaporated, nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangolds, and swede turnips. Plant out Paspalum roots. Seed wheat, of whatever variety soever, should be dipped in a solution of sulphate of copper (bluestone), in the proportion of 1 lb. sulphate to 24 gallons of water. The seed may also be heated with hot water by plunging it in a bag into hot water at 120 degrees F. for a minute or two, and then into water heated to 135 degrees F. Allow it to remain in this for ten minutes, moving it about all the time. Then plunge the seed into cold water, and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against bunt, smut, black and red rust, is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. Schering's formalin costs about 2s. 10d. per lb., and is sold in bottles. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but while the latter can be used over and over again formalin becomes exhausted. It therefore follows that only the amount required for immediate use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient; more on poor land and less on rich soils. On light, sandy soil the wheat should be rolled. On sticky land, it should only be rolled when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 inches high, go over it with light harrows. If the autumn and winter should prove mild, and the wheat should lodge, it should be kept in check by feeding it off with sheep.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

FLOWER GARDEN.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camelias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants, such as verbenas, petunias, penstemons, &c. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas, &c. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bonedust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots, and plant bulbs as recommended for March.

Agriculture.

SHEEP ON THE FARM.

SHROPSHIRE SHEEP.

The Shropshire sheep thrives in all parts of the British Islands, as well as in the United States, Canada, Australia, South America, and generally in France, Germany, and other continental colonies. The breed is especially adapted to crossing with merinos, for the purpose of obtaining fat lambs for the market. The Shropshire thrives admirably in Queensland, and especially recommends itself as the farmers' sheep for various cogent reasons, amongst which are the following, as given by Mr. Alfred Mansell, Shrewsbury, in his "History of the Shropshire Sheep":—

No breed is more prolific, and with ordinary management and care during the autumn and winter months (negligible to a great extent in our Queensland climate) at least 50 cent. of doubles may be looked for. Thousands of Shropshire rams are sold yearly for crossing purposes—*i.e.*, to get fat lambs and to cross with merinos and merino-grades for producing freezers. Shropshire ewes are well adapted for the lamb and dam trade; in fact, it seems to be one of their special qualifications, for not only do they feed their lambs well, but, as a rule, they are ready for the butcher as soon as their lambs are sold. . . . The average clip for a fair Shropshire flock (fleece and teg-wool) would be 7 lb., but many flocks average quite 8 lb., and it usually commands the highest price of any English wool. Individual fleeces often reach 14 lb., which is maintained for the second and third years.

Another great point in their favour is their strong constitution and natural hardihood, for they will thrive and do well on grass or arable land where any other breed can do so. Nowhere does this breed do better than in the humid climate of the Emerald Isle. There are many breeds of sheep that thrive well in their native district, but few that do not deteriorate when removed to countries where their environment is changed. It is a valuable characteristic of the Shropshire that it quickly becomes acclimatised and long maintains its many good qualities, even in surroundings widely differing from the home of the breed.

FAVOURABLE POINTS IN CONNECTION WITH THE PURE SHROPSHIRE SHEEP.

Writing on this subject, the "Natal Agricultural Journal" says:—

Prolific Character.—One hundred and fifty to 175 lambs per 100 is the usual average; 11,666 ewes in 1896 reared 168 lambs per 100 ewes. The actual produce was, of course, larger.

The Ewes good Mothers.—Shropshire ewes are excellent nurses, and Nature has endowed them with great milk-yielding properties.

Wool Properties.—The Shropshire sheep cuts a heavy fleece of wool of the most marketable description, being of good staple, fine in texture, and very dense, and is always readily saleable.

Adaptability to various Soils and Climes.—The most ubiquitous sheep extant, in every county of England, the Shropshire sheep flourishes, also in the Highlands of Scotland, the humid climate of Ireland, and the mountainous districts of Wales, frequently at an altitude of 1,000 feet above sea-level.

The Shropshire thrives and does well in the United States, South America, Russia, France, Germany, the Australian colonies, South Africa, Jamaica, and the Falkland Islands, and indeed in every part of the world.

Early Maturity.—If well cared for, the wethers are fit for the butcher at ten to twelve months old, and that on a moderate consumption of food as compared with other breeds. Shropshire lambs mature very early as fat lambs, and the Shropshire cross for the fat lamb trade cannot be beaten.

Constitution and Hardihood.—The breed is notoriously sound in constitution and capable of withstanding extreme variations of heat and cold, and is one

of the most hardy breeds in existence. The writer has seen a Shropshire ewe nineteen years old, hale and hearty, having reared thirty-three lambs, and herself enjoying absolute immunity from footrot during the whole period.

Quality of Mutton.—The mutton of the Shropshire is rich in flavour, close in grain, juicy, and contains a large percentage of lean meat, and commands the highest price in London, Manchester, Liverpool, and all the principal markets in Great Britain.

Docile Character and Economic Consumers.—The Shropshire is a placid and contented animal, not given to roaming and trampling down pasturage, and has the especial aptitude to make the best of the food at hand and to produce mutton at a minimum of cost.

NOTE.—These characteristics are conveyed to the Shropshire crosses in a remarkable degree.

General-purpose Sheep.—Shropshire sheep have rapidly increased in favour in all the Australian colonies, and, combining as they do the most desirable points (from a wool and mutton point of view) to a greater extent than any other breed with the minimum of objectionable features, they have obtained an eminent and permanent position in the estimation of sheepbreeders all over the world. In fact, they meet all the requirements of the present day as a successful general-purpose sheep, and are, therefore, profitable to farmers and graziers. The Shropshire has been largely bred for crossing purposes to produce freezers, with splendid results. The Shropshire merino cross produces a fine sheep, and preferred by many who have tried it to any other cross. The half-bred is a deep, square-set sheep, well covered with a fine fleece, which gives a high percentage of clean scoured wool, and commands a comparatively high price, whilst the sheep are hardy and fatten to nice handy weights at a very early age.

For mutton purposes and the frozen meat trade, Mr. Alexander Wilson, of Sydney, considers crossbred ewes should be mated with Shropshire rams if the best results are to be obtained.

The special requirements of the English market are quality and not quantity.

Mr. Alexander Bruce, Chief Inspector of Stock for New South Wales, in 1894 visited England for the special purpose of obtaining reliable information as to the London market requirements in frozen mutton and lamb. After going fully into the matter, he gave the average prices obtained in London for mutton and wool of prime fat wethers, twenty to twenty-two months old, got by English rams of the breeds given below out of merino ewes:—

English Ram.	Mutton.	Wool.	Total.
	£ s. d.	£ s. d.	£ s. d.
Shropshire	1 0 2¼	0 5 7½	1 5 9¾
Lincoln	0 19 8¼	0 6 0	1 5 8¼
Border-Leicester	1 0 0	0 4 10	1 4 10
Romney Marsh	0 18 9	0 4 8	1 3 5
South Down	1 0 0½	0 3 9	1 3 9½
Pure Merino	0 11 5½	0 3 9	0 15 2½
Shropshire Cross, wool and mutton	...	...	1 5 9¾
Pure Merino Cross, wool and mutton ...	...	...	0 15 2½
Difference in favour of Shropshire Cross	...	...	£0 10 7¼

EXCESSIVE IRRIGATION.

Some time ago, Dr. W. Maxwell, when inspecting irrigation operations on the Burdekin Delta sugar plantations, pointed out to one planter that too much water was being applied to one large block of cane, to the detriment of the cane, and to the further loss from waste of engine power, fuel, and labour. The amount of water was reduced by one-half, and the result was eminently satisfactory. Some people hold the opinion that in the drier portions of Queensland

too much water cannot be applied to the land, but this is a great mistake, as has been pointed out by C. D. H. Braine, A.M.I.C.E., Executive Engineer of the Transvaal Irrigation Department, in a paper entitled "Notes on Irrigation in South Africa," read before the British Association at Johannesburg. Mr. Braine said:—"Unskilled irrigation means a very large percentage of water, and, not only that, but many crops are impaired by an over-abundant supply. This fact should be thoroughly understood and carefully considered when attempting to fix the duty in a country where no effort has been made to ascertain from actual experience the amount of water required. If irrigation water is used too frequently or too abundantly, the salutary habit of deep-rooting will be abandoned by the plant, and it will be dependent upon frequent rains or irrigation, and also, owing to the small bulk of soil from which it can draw its nourishment, upon frequent and abundant fertilisation. Investigation made in California shows that the effect of a prolonged drought of over a year only penetrated about 4 feet into the soil, and at 10 feet down the soil was moist and plastic. In such soil deep-rooted perennial weeds were flourishing. Fruit trees, if deeply rooted, require very little irrigation. . . . in fact, water requires to be used intelligently. Waterlogged land is one of the curses of unscientific irrigation, and over-irrigated or asphyxiated roots are frequently the cause of fruit dropping off. It is characteristic of the mode of land plants that they only flourish, as a rule, when their roots are evenly distributed throughout the soil that is relatively dry and only partially flooded with water. Paradoxical as it may seem, I know a case where the failure of a precarious supply of water resulted in the death of all the trees in one part of a small orchard and the preservation of those on another part. The farmer had planted out a young orchard, and was constantly irrigating with a quantity of water only sufficient to moisten a thin upper layer of soil. This brought all the young roots to the surface, and as the supply diminished, the plants at the further end of the orchard were left to their fate. But the process was continued to a gradually narrowing area as long as any water lasted, and finally the supply failed. The roots of the plants that had been watered last were all in the surface soil, which became caked and heated, and the trees died. Those that had not been watered for some time all lived, for the young roots had time to penetrate below the effect of the drought, and were drawing moisture and nourishment in a natural way from the deep subsoil."

MAIZE AND SORGHUM IN THE SILO.

Professor Chas. M. Couner, vice-director of the Florida Experiment Station, lately read a paper on "Silos and Silage" before the Georgia Live Stock Association, at Macon, U.S.A., which is reported in full in the "Florida Agriculturist." Amongst other things he said:—

Cut the corn just as soon as the grain begins to harden; sorghum can be allowed to stand for some time after the seeds begin to ripen up before it will injure. This is one advantage that sorghum has over corn for the silo.

Now a few remarks in regard to filling. Keep the edges well packed by having a man walk around keeping one foot next to the boards while he is pulling the cut stuff from the centre toward the walls. The middle will usually take care of itself, because the weight of the falling silage will keep it more or less packed. If there should be any dead or dried leaves, use some water; if the quantity of dried or dead leaves is quite large, then be sure that you use enough water. As I said before, it is better to have too much water than not enough. The danger of not having enough water is that the heat from the fermentation has a tendency to dry out the material, and if there is not enough water to last through this heating process dry rot sets in and spoils all of that part which is not moist enough. The last time I filled my silo, I kept water running on the carrier all the time. The reason for this was that the corn had fired near the ground, and I was afraid there was not enough water in the corn

to prevent spoiling. The silage was good next to the boards from within 3 feet of the top to the bottom. Where you use velvet beans, or cowpeas, or even sorghum, with corn, there will usually be enough water in these other crops to save the corn. If you have no way of allowing water to run on by a hose or something of that kind, sprinkle one half-barrel of water in the silo for about every load or two loads of cut stuff. When the silo is finished, be sure to wet the top thoroughly; then wet it again in about four or five days. But when you put on the second application of water, do not disturb the top, as this will cause it to rot unevenly. The object of this wetting is to cause the material to rot thoroughly, which seals the top over and prevents air from getting in.

In this climate build your silo of such a size that the stock that you are feeding will consume a layer 2 or 3 inches thick in one day. The reason for this is that it spoils quickly when exposed to the air in this warm climate. If there should be any spoiled around the edges on account of air getting through the cracks, throw it out, and keep the top perfectly level as you feed down.

HOW TO RAISE POTATOES FROM SEED.

We are not aware that any attempts have been made by Queensland potato-growers to raise new varieties from seed. The potato plant flowers freely in this State, although the flowers usually drop off before the fruit or "apple" is formed. Where, however, the "fruit" as distinct from the "tuber" comes to maturity, there is no other reason why Australian growers should not evolve a prolific disease-resisting potato equal to some of those lately raised from seed in England and sold at such enormous prices. A correspondent of the "Agricultural Gazette," London, has, through the inquiry column of that journal, elicited the following instructions for raising new varieties from seed:—

Those who desire to produce new varieties of potatoes must first practise the art of cross-fertilisation, and must possess abundant patience. Like many other species which are not habitually multiplied by seed, the potato has a remarkable tendency to revert to the wild form. It may be necessary to cultivate 100 or even 1,000 seedlings, before finding one which is really worthy of a place among the better varieties already existing. M. Vilmorin says that in France the raising of seed potatoes has been proceeded with in a somewhat haphazard manner; whereas in England, on the other hand, a more systematic method has been followed, richness in starch, excellence of flavour, power of resisting disease, with little tendency to develop haulm, being the characters we on this side the Channel generally seek. With regard to cross-fertilisation, it is rather a delicate operation, and needs time and attention to details. Directly the flower begins to open, the anthers must be removed carefully with a pair of fine-pointed scissors. This is necessary to prevent its own pollen from falling on the stigma and self-fertilising the ovary. It is well also to tie a piece of soft muslin round the emasculated flower. You have now to examine the flowers of the other variety which is to act as the male or husband. You may have to examine dozens of flowers before you will find one with its anthers bearing the precious pollen in a powdery form, as some varieties are exceedingly shy pollen-bearers, owing to the energies of the plant being occupied in producing tubers at the expense of full development of its masculine attributes. When you find the pollen dust, collect it carefully on the point of a clean, dry camel-hair brush, and gently brush it on the point of the stigma or female organ that you had previously protected by means of muslin. You must, however, not do this prematurely, but wait till you observe the point of the stigma covered with a viscous-looking fluid. Then, and then only, the stigma is ready for the nuptial rites to be performed. Do not remove the muslin; this will serve to prevent the berry when ripe from falling and scattering its precious seeds. It will easily be ascertained when the berry is ripe, and then the latter should be gathered, placed in a box in a room to become thoroughly dry, after which remove the seeds, place them in a packet, and store them away safely

till spring. But, when the seed has been saved after much pains and trouble, it will require some humouring when it is time to sow. Then the seeds should be sown in pans or shallow boxes 3 inches deep, containing an inch of drainage, then a layer of moss, and sufficient compost, equal parts of light loam and leaf-mould, to fill the box or pan to the top. Press the compost down firmly with a piece of board, and sprinkle some fine sand over it. Sow the seeds thinly, and then cover with an inch of finely sifted mould. The soil must not be too moist or too dry, as the seeds may die in one case or rot in the other. The seedlings should appear in about ten days, and they must have abundance of fresh air. Some writers suggest that the soil should be baked before sugaring it over the seeds, as the damping-off fungus is rather to be dreaded.

GREEN MANURING.

For renovating a worn-out soil, several leguminous plants, such as various kinds of peas, cowpeas, velvet beans, &c., are utilised, preference being given to those nitrogen-absorbing plants which root deep, are succulent, and consequently decay soonest. In America the lupin is preferred. Dr. Hilgard, of the Oakland Agricultural Station, California, says that lupins combine all the points required of a green manure plant—nitrogen absorption from the air, deep rooting, and, at the proper stage of growth, that succulence which is conducive to quick decay, thus rendering the crop ingredients available at the earliest moment. In California there are ten varieties of the lupin, of which the large blue has been found the best. When lupins have not been properly cultivated, it serves to greatly expedite their growth to inoculate the soil from localities where lupins have been growing, because the bacteria peculiar to lupins do not readily make tubercles on plants of any other leguminous germs. As to the method of planting, the custom in California is to use a beet drill, which is the least expensive, as 15 or 20 acres a day may be planted in this way. A beet cultivator is recommended for preparing the ground for planting. The benefits that accrue from green manuring with lupins are described as comprising an improvement of the physical properties of the soil, the content of the humus is increased, and consequently the plant food is brought from lower to higher level by the most expensive plant food—nitrogen being obtained from the air.

"The Farm" says that in searching for a green manuring plant as suitable for a dry climate, as peas are for the moister regions, Mr. Lydgate, of a sugar plantation in Hawaii, recommends the lupin, now being used there as a renovator of worn-out sugar lands. Sown in the beginning of winter, he says, it grows in four months to a height of 3 to 4 feet, covering the field with a heavy growth. At first considerable difficulty was experienced in ploughing under because of the size of the plants and the immense amount of foliage, but this has been overcome by the use of the disc plough, which cuts them clean and turns them completely under.

GROWING MANGELWURZELS.

By. C. ROSS, Manager, Westbrook State Farm.

"The following notes on the subject of growing mangelwurzels are not," says Mr. Ross, "intended to represent a paper covering the whole business. They are merely jottings from my own experience, and contain a few practical common-sense remarks, which will be more to the point than if I waded through a lengthy paper full of scientific terms." The paper was read before the local Progress Association, by whose members Mr. Ross's remarks were much appreciated. He said:—

The mangelwurzel appears to have been much prized by the ancient Romans as an article of food, and was probably first introduced by them into England. It was again introduced as a field crop from Germany about one hundred years

ago, although some authorities consider the native Sea Beet *(Beta maritima)* of Britain to be the origin of all the present cultivated forms of mangel and beet.

In discussing the subject of root crops, I have chosen the mangel as representing, in my opinion, what should be the most important root crop for feed and dairy purposes for the Darling Downs. Its culture is simple; it will adapt itself to a greater variety of soils and weather conditions, it can be used as forage in any month of the year, is a heavier yielder, and, as a milk producer, is equal if not superior to most other root crops. Another recommendation for its culture is that it is attacked by insect and fungoid pests to a much less extent than any forage root I know. In fact, its enemies are practically nil.

Seed.

The seeds being contained in a rough, hard capsule, it frequently occurs that two or more plants grow together, and must in consequence be thinned out if good-shaped roots are desired. The quantity of seed sown per acre depends on the condition of soil and on the varieties to be grown.

In a general way, I should recommend 4 lb. of seed per acre for the mammoth sorts, and 6 lb. for the intermediate or Tankard varieties. In deep, rich clays and loams the Mammoth L. Red and Yellow Globe produce very heavy crops of good quality. For shallow soils the Golden Tankard and Yellow Intermediate cannot be surpassed.

Time of Sowing.

Whereas in Europe, New Zealand, and other parts where mangels are largely grown they have only one seeding time, we have in this part of Queensland two seeding seasons—autumn and spring—for main crops. The crop from the autumn or March sowing comes in for use when most required—*i.e.*, from June to December. The August or spring sowing can be fed to stock from January to the end of winter. Either of these periods may be extended if desired by making successional sowings or by leaving the matured roots standing in the ground.

For the autumn sowing I recommend the following procedure:—

After the present harvest is gathered in (which, unfortunately, will not be a big operation), the land should be ploughed as soon as possible—at any rate, sufficiently early to insure the action of the atmosphere to thoroughly disintegrate the surface deep enough to form a good bed of free mould. If much weed growth takes place, it will be necessary to give a shallow cross-ploughing or the land must be kept well scarified. Early in March the land should be harrowed as deeply as it will work freely. By this plan the moisture is retained and the seed can germinate better. By deeper cultivation and consequent evaporation it is often rendered so dry that germination is dependent on rain. The finer the tilth, the surer will be the strike. If dry weather prevails, a good rolling to set the seed firmly in the seed bed would further insure the object to be attained. My experience is, that March is the best month for autumn sowing, although planting may successfully extend to the middle of April. The seed may be drilled in by the ordinary wheat drill (stopping the tubes not to be used) or by a hand seed-sower. If these machines are not available, a horse or hand Planet Junior cultivator can be used to open the drills, or the drills may be opened by an ordinary chipping hoe, and the seed dropped in by hand. In any case, if the soil is not moist enough to bring the seed up at once, it would be better to roll it. Under favourable conditions the seed will germinate in from seven to ten days, but in other cases may not do so for a very much longer period.

I usually allow 30 inches to 36 inches between the drills for the large sorts. The distance from plant to plant in the drills may be regulated according to the variety sown or the size of roots desired. A distance of 15 or 20 inches in the row averages, I think, the best results; but, if very large roots are required, the plants may be thinned out to 30 inches. Now, for sugar beets and the smaller varieties of mangels, these figures, especially if the crop be grown on poor land, may easily be reduced by 30 per cent.

When the seed is well up and thinning out has been done, the after culture consists in keeping the crop clean by running the horse hoe through it as often as possible. It goes without saying that the cleaner the crop is kept the better will be the result. Even the thinning out to a great extent may be left until the plants have made fair-sized roots, when pigs would do well on them.

It is not necessary to go into the manures required in this district, but it might be mentioned that we are treating of a marine plant, and that salt is always a good stimulant to this crop. It also takes up a large amount of potash, so that kainit might be used as a top dressing to advantage. The mangel adapts itself very well to transplanting, the one essential being that the plants must be strong, and the root should be quite as thick as one's thumb, and, practically speaking, if the weather is dry, the bigger the plant the better, so that any vacancies occurring in the crop can successfully be made up from the thinnings, or the plantation may be extended. The weight per acre that can be grown is astounding. I have myself grown 40 tons on light, thin land, and over 50 tons to the acre on heavy, black clay in this country; but in England, where heavy manuring and intense farming is practised to enable the very many thousands of acres of land under this crop to produce feed for stall-fed and dairy stock, the yields reach as much as 60 to over 100 tons per acre.

The feeding qualities of mangels are of a high order. It is said that mangel roots contain 25 per cent. more feeding value than turnips—that is to say, that 75 lb. of mangel equal in feed value 100 lb. of turnips. These results have been arrived at by comparing the analyses of several chemists. Results under feeding experiments also clearly prove that a given weight of small or medium-sized roots is immensely superior to a similar weight of large roots.

From another source the particulars of chemical analysis give swedes a higher percentage of feed value than mangel, but such difference may occur from the condition of the roots analysed, and practical experience does not always bear out the experience of the laboratory; and I have it from Mr. Mahon, the Principal of the Agricultural College at Gatton, that he has found mangels to be an excellent fodder for milch cows, and quite contrary to the value placed upon them by chemical analysis in the laboratory. Now, the weight of all root crops is out of proportion to their nutritive value; they consist of nearly 90 per cent. of moisture as against 80 per cent. in fresh grass and 10 to 14 per cent. in dry food. But the dry matter in the mangel is practically all digestible, which cannot be said of many other stock foods. It is especially rich in sugar, and as a milk-producer is equal, if not superior, to either swedes or sugar-beets, and they never taint the milk.

In conclusion, I must ask to be excused if I have not made myself as clear as I should desire. The fact is, I have not seriously given the attention to the subject which it deserves.

I have not mentioned the methods of lifting and storing, or gone deeply into the manures most suitable. I have only touched the fringe of the results of practical field, feed, and milk-producing experiments, and of the scientific analysis in the laboratory. These questions would be more interesting to very large growers, and the object of these remarks is to interest the small dairy farmers of the Downs. I say now, as I did at first, the subject is a long way from being exhausted; and, so far as my ability will allow, I shall be glad to answer any question in connection with it. I shall consider I have done some little good if a discussion is opened and opinions freely ventilated.

I should advise those who intend planting to obtain their seeds from thoroughly reliable seedsmen, and not from people of other trades who have never been brought up to the business. I am in a position to say that the seedsmen of Toowoomba import mangel and sugar-beet seed from England, Germany, and New Zealand, and also from the best growers in Victoria; and my personal experience is that seed obtained from the two latter sources is the most satisfactory.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 31ST JANUARY, 1906.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Beauty ...	Ayrshire	10 Dec., 1905	951	3·7	39·40	
Bee ...	Jersey	11 Nov. ,,	560	4·6	28·85	
Belle ...	,, ...	4 Oct. ,,	578	5·5	35·60	
Blank ...	Jersey Ayrshire	7 Dec. ,,	1,040	5·2	60·56	
Burton Whitefoot	Shorthorn ...	6 Aug. ,,	671	3·9	31·32	With first calf
Careless ...	Jersey	3 Sept. ,,	548	4·9	30·07	
Carrie ...	,, ...	13 Nov. ,,	922	4·2	43·37	
Chocolate ...	Shorthorn ...	27 Oct. ,,	940	3·5	36·84	
Cocky ...	Ayrshire ...	28 April ,,	563	4·5	28·62	With first calf
Cocoa ...	Jersey	9 Oct. ,,	692	5·2	40·30	
Count ...	Shorthorn ..	19 Dec. ,,	724	3·4	34·86	With first calf
Cuckoo ...	Jersey	1 Dec. ,,	530	5·0	29·68	With first calf
Dolly ...	Shorthorn ...	1 Aug. ,,	580	4·0	25·98	With first calf
Dora ..	,, ...	18 May ,,	582	4·0	26·07	
Dott ...	,, ...	8 Sept. ,,	686	4·2	31·27	
Dripping ...	Holstein Sh'rt'hn	18 July ,,	668	4·0	29·92	
Gem ...	Shorthorn ...	19 July ,,	653	4·5	32·91	
Grace ...	South Coast ...	19 Nov. ,,	988	3·6	39·84	
Gurney ..	Shorthorn ...	14 Oct. ,,	745	3·0	25·03	
Ivy ...	Jersey	13 Nov. ,,	730	4·6	37·61	
Kathleen ...	Shorthorn ...	20 April ,,	27	3·6	1·09	Dried off, 4th Jan.
Lady Ring ...	Guernsey ...	17 Nov. ,,	550	6·0	36·96	
Laura ...	Ayrshire	2 Jan., 1906	804	3·2	28·82	
Lavina ...	,, ...	14 Dec., 1905	1,041	4·8	55·96	
Leasome ...	,, ...	10 Oct. ,,	758	5·1	43·30	
Lemon ...	Grade Shorthorn	18 Aug. ,,	699	3·8	29·75	
Linda ...	Ayrshire	23 April ,,	582	4·4	28·68	With first calf
Lonesome ...	,, ...	16 Dec. ,,	654	4·1	30·03	
Loss ...	,, ...	11 May ,,	599	4·3	28·41	With first calf
Lottie ...	,, ...	6 Aug. ,,	579	3·9	25·29	
Louisa ...	Shorthorn ...	1 Aug. ,,	830	3·6	33·47	
Lowla ...	Ayrshire ...	12 Dec. ,,	1,036	3·2	37·13	
Luck ...	,, ...	24 Sept. ,,	673	4·0	30·15	
May ...	Shorthorn ...	6 Oct. ,,	669	3·7	27·72	
Nellie 2nd ...	,, ...	14 Aug. ,,	570	4·6	29·37	With first calf
Nestor ...	,, ...	9 Dec. ,,	654	4·0	29·30	
Nettle ...	,, ...	4 May ,,	486	4·6	25·04	With first calf
Night ...	Holstein Devon	30 Dec. ,,	897	3·7	36·97	
No. 6 ...	Shorthorn ...	19 July ,,	600	4·6	30·91	With first calf
No. 48 ...	Ayrshire Sh'rth'rn	11 July ,,	766	4·0	34·32	
No. 112 ...	Grade Jersey ...	5 June ,,	636	4·1	29·21	With first calf
Omah ...	Jersey	4 Nov. ,,	456	5·1	26·05	
Pansy ...	Grade Jersey ...	22 Sept. ,,	765	4·2	35·99	
Peawee ...	Holstein Sh'rth'rn	27 Nov. ,,	945	4·2	44·45	
Reanie ...	,, ,,	5 Sept. ,,	827	3·4	31·49	
Restive ...	Shorthorn ...	30 Aug. ,,	683	3·8	29·07	With first calf
Rhoda ...	Grade Shorthorn	13 Oct. ,,	717	4·4	35·33	
Rose ...	Shorthorn ...	11 June ,,	739	4·6	38·07	
Rum ...	Holstein Ayrshire	25 Dec. ,,	836	3·8	35·58	With first calf
Sue ..	Grade Shorthorn	3 Oct. ,,	636	3·6	25·64	
Tiny ...	Jersey	24 Sept. ,,	513	4·8	27·58	
Venus ...	Ayrshire Sh'rth'rn	22 Oct. ,,	596	3·8	25·37	
Violet ...	Shorthorn ...	1 Aug. ,,	671	3·5	26·30	
Whitefoot ...	Holstein Sh'rth'rn	11 July ,,	726	3·4	27·65	
Winnie ...	Shorthorn ...	2 Oct. ,,	789	3·8	33·57	

THE DAIRY HERD—*continued.*

Returns from 1st to 28th February, 1906.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Beauty ...	Ayrshire... ...	10 Dec., 1905	696	3·6	27·84	
Laura ...	,, ...	2 Jan., 1906	803	3·0	26·98	
Lavina ...	,, ...	14 Dec., 1905	790	4·6	40·70	
Leesome ...	,, ...	10 Oct. ,,	575	4·9	31·56	
Lowla ...	,, ...	12 Dec. ,,	746	3·6	30·08	
Hettie ...	Ayrshire Sh'rth'rn	28 Jan., 1906	780	3·5	30·58	
No. 48 ...	,, ,,	11 July, 1905	627	4·1	28·79	
Lady Ring...	Guernsey ...	17 Nov. ,,	469	6·0	31·52	
Rum ...	Holstein Ayrshire	25 Dec. ,,	643	3·9	28·09	With first calf
Night ...	,, Devon ..	30 Dec. ,,	708	4·0	31·72	
Dripping ...	,, Sh'rth'rn	18 July ,,	578	3·9	25·25	
Mona ...	,, ,,	16 Jan., 1906	1,020	3·0	34·27	
Peawee ...	,, ,,	27 Nov., 1905	686	4·0	30·73	
Reanie ...	,, ,,	5 Sep. ,,	653	3·6	26·33	
Beatrice ...	Jersey	22 Jan., 1906	576	5·0	32·26	
Bell ...	,, ...	4 Oct., 1905	487	5·5	30·00	
Carrie ...	,, ...	13 Nov. ,,	606	4·4	29·86	
Cocoa ...	,, ...	9 Oct. ,,	621	5·1	35·47	
Cuckoo ...	,, ...	1 Dec. ,,	462	5 0	25·87	With first calf
Ivy ...	,, ...	13 Nov. ,,	542	4·6	27·92	
Blank ...	,, Ayrshire	7 Dec. ,,	813	5·0	45·52	
Chocolate ...	Shorthorn ...	27 Oct. ,,	737	3·8	31·37	
Count ...	,, ...	19 Dec. ,,	686	3·4	26·12	With first calf
Dott ...	,, ...	8 Sep. ,,	552	4·3	26·58	
Gin ...	,, ...	26 Jan., 1906	737	3·5	28·89	With first calf
Nestor ...	,, ...	9 Dec., 1905	550	4·1	25·26	
Winnie ...	,, ...	2 Oct. ,,	589	3·8	25·07	
Rhoda ...	Shorthorn Grade	13 Oct. ,,	584	4·5	29·43	
Grace ..	South Coast ...	19 Nov. ,,	688	3·7	28·51	

THE MILKING MACHINE.

Mechanical milking of cows has been a problem before inventors for the last fifty years, and, as many say the problem has now been solved, the experiences of one who has been through the mill may be interesting to some. There recently has been a boom in the north country in the use of some one or other of these machines. Some have used them two years, some three; some are just beginning to use them, and one known to the writer has been in use about fifteen years, if it is still running.

About two and a-half years ago I had one erected in my shed, and for eighteen months all my cows—from 80 to 100—were milked with the same. I stopped it and took it down about a year ago, and went back to hand milking, and now, after the lapse of another year, when one can take a "judicial" view of matters, I lay my experiences before the reads of the "Gazette." My installation, when all the "extras" and spare parts were paid for, cost about £240 for 80 cows, or about £3 per head, though I must explain that in this was included a steam boiler, which was suitable for steaming purposes outside the milking parts, and was used as such. I found that the annual expense of running the thing, at least for the first year, was about £50; the coal for the boiler alone, over and above the proportion usually employed for boiling and steaming, was £30; while the repairs, replacing the rubbers, &c., were another £20, and this did not allow for the tremendous depreciation of the whole plant which would have to be met in the course of years.

I started the apparatus, and at the end of two months or so was getting on so well that I invited all my neighbours to come and see it at work one afternoon. About sixty responded to the invitation, and at that time I would almost have given it a testimonial, but thought I would wait to see what happened

later on. As a result, the milk yield began to go down, and kept down ever after, and I never got it up again until three months after I stopped machine milking.

I have for many years kept a milk record, and so know pretty well what my cows are doing individually and collectively, and therefore am able to give actual figures as to the results of machine milking. For the twelve months before I had the machine, but including three months' time of the same, the average yield per head was 612 imperial gallons. For the twelve months during which the machine was in full use the average was 337 gallons per head, and for the twelve months after the machine was dropped the yield was 552 gallons. My usual run is about 650 gallons per head, taking good and bad together, and it would have been about that under ordinary circumstances, but for the effect of the machine for three months before and three months after the twelve months reckoned to it in the above calculations. In other words, the machine will only get from a half to two-thirds of the milk from a cow that hand milking will do.

Now a few words as to the conditions under which the experiment was tried, because I may be told that I did not give it a chance, did not give it sufficient personal supervision, &c. To begin with, my two cowmen were natives of the same county as myself, were keen to make it a success, and it was largely at their instigation that I had the installation set up. One of these men was a born mechanic, who could take any piece of machinery to pieces, repair it, and put it together again. As for myself, I was an engineer in my youth, have a hereditary knowledge of mechanics, and have an outfit of every possible kind of tool in my workshop on the farm that is likely to be of use; and, moreover, I am in the habit of using the same, for I am never happier than when at the bench or the vice. The mechanical part of the milking machine was, therefore, under the control of two of us who were mechanical experts. As to the other two cowmen, who helped with the work, stripped out the cows, &c., all were kept on, and they were given to understand they would not lose their jobs, and were otherwise encouraged to help to make the thing a success. As to myself, I was in the cowshed every morning before 5 o'clock for several months after we started it, and never missed being present a single milking time, and took a share of the work myself. Later on, when results were getting worse, I worked at it again myself for several months. I procured a set from a friend who was working the apparatus of another maker, and tried this, but it was no better. Then I designed and had made for me a set which combined the good points of two makers' machines, and which was simpler and more efficient than either. I took a row of fourteen cows which stood in one lot, and experimented with them myself for months. Some of these were special pets of my own, which would allow me to do anything with them, and they chewed their cuds while the suckers were on; but, in spite of all, I had the mortification of seeing the yield go down, no matter which machine was tried.

I have accumulated a vast quantity of figures, analyses, and other results from my eighteen months' trial, which would occupy too much space to detail here, but it is sufficient to say that the milking machine in three varieties has been a disastrous failure with me, and I have got a lot of information in reserve for anyone who thinks the machine is a success.

There is one point in connection with the physiology of milk secretion which everybody—including myself—seems to have forgotten, but which I have had enforced on my attention at enormous cost. This is the fact that the milk is secreted after the act of milking has begun. There is only a quart or so of milk ready-made in the teats and milk-bag of a cow before milking begins, and the amount and quality of the milk she does yield will depend largely on how she is milked. Now, ordinary milking by hand is a species of massaging which stimulates the flow, and this is wanting in a machine; while if you massage the udder while the machine is on—as I did—you might as well milk by hand, and save the trouble and expense of the machine altogether. The mechanical act of sucking milk out of a cow's teat is very easy of accomplishment, but that is not all

that is required in milking. There is the mental state of the cow, the effect of prolonged hand *versus* machine manipulation on the udder, and so on. In the machine you think it is all right to look at; you see the milk spouting in the glass tubing, and you think how nice and clean and handy it all is; but the enormous labour required to keep the apparatus clean, and the fact that a cow goes dry in seven and a-half months which ought to milk nine and a-half, is sufficient to kill the enterprise in this line.

It is rather a dangerous thing to prophesy as to future inventions, and we do not know what mankind may accomplish in another generation. We have seen marvels brought out, such as the Rontgen rays, radium, the telephone, the Marconigraph, and so on, and we may therefore yet see a successful milking machine, but it has not arrived as yet.—P. McConnell, B.Sc., in the "Agricultural Gazette," London.

[We understand that the milking machines in use at Hawkesbury College, New South Wales, give great satisfaction. There are several in use in Queensland, and we have not heard that the owners are dissatisfied with their work.—Ed. "Q.A.J."]

INDIGESTION AMONGST PIGS.

The "Agricultural Gazette," London, has the following on the above subject. Although there is nothing new in it, still the remarks on the dieting of pigs are worth noting:—

Many of the ailments among pigs, especially those that are being forced in their feeding, are brought about in the first place by indigestion, often the result of too much grain or corn meal in the diet, rendering it too heating and heavy. When off their food pigs come to a standstill as regards the process of fattening, because what little they eat does them no good. The food that fulfils the end desired is that which is thoroughly and properly assimilated; nothing else counts.

When a falling off in the appetite is noticed steps should be taken at once to set matters right. Of course, the better plan would be to try and prevent this sickness of the system occurring, but this cannot always be managed, although carefulness and attention will do much in warding it off. Pigs half-way on in the fattening stage, or a little later—*i.e.*, when the owner is weighing the bacon in his mind's eye—are mostly the sufferers. Porkets, too, when they are very young and being quickly pushed on. It is a very disappointing thing, indeed, to have a fine weighty bacon pig succumb through being "staked"—*i.e.*, stoppage of the bowels, or "struck"—apoplexy. The fat pig that is in a perfectly healthy condition will eat to repletion no more, and be benefited thereby. It is a wrongly-chosen diet, with unsuitable ingredients, that causes mischief. Close confinement and heavy feeding on grain and meal, with an entire exclusion of vegetable from the rations, makes a great tax on the system and digestive powers; also, continuous feeding on one kind of food, or two at most, is not to be recommended, as it is liable to "stall" or sicken and surfeit the animals; a mixed diet is by far the best, and one that includes some vegetable. Potatoes and artichokes are the cheapest and most suitable. They help the digestive apparatus, and assist in the maintenance of health. A combination of three or even four good meals in correct proportion, forming a mixed diet, furthers the fattening process, and keeps pigs in far better order than does one composed almost exclusively of wheat or maize meal. If a pig is being fed on the right kind of food his skin will be smooth and clear, not rough and blotched with red patches and breakings-out. Irregularity in the times of feeding, resulting in the pigs getting greedily hungry, and, when their food comes, gorging themselves, sometimes brings on stoppage.

The plan of keeping a small heap of charcoal and ashes in a corner of the sty or yard is most advisable, and should always be followed. Constipation may be brought on by store pigs gorging themselves with acorns, beech mast, &c. It is well not to allow them to have free access to large quantities.

The Horse.

BREEDING HORSES.

The "North British Agriculturist" republishes a letter from Mr. James Moffat to a South Australian paper on the deterioration of the breed of horses in Great Britain and Australasia. Mr. Moffat has contributed several valuable articles on horse-breeding to the "Queensland Agricultural Journal." With the history of the horse, as detailed by him in his letter, from the time of the Phœnicians to the reign of Edward III., we are not much concerned. What follows is, however, of much interest. The writer says:—

The history of improvement of English horses, when deteriorated by this admixture of Belgian blood, begins with Edward III.'s importation of Barbs from Spain, and again in James I.'s reign, when the English thoroughbred (Arab) herd was established for this purpose.

The deteriorated conformation which has arisen in this herd is simply an eruption from the polluted matrix of England's stock, and would not have occurred had the English thoroughbred been established on the true Eastern matrix of Ireland's stock.

The advice given at this time to have recourse to this Suffolk-*cum*-Belgian stock is certainly not sanctioned by past experience in England.

The highest class of horses have been obtained from the Shire stock as a matrix, with use of thoroughbred (Arab) sires.

The stock produced from the Suffolk matrix, by the use of thoroughbred—the Norfolk—have much in common with the inferior German horse.

Our Australian stock of draught horse is far more heavily strained to Eastern blood than the Shire stock of England, and for this reason constitutes a better matrix for purposes of improvement if thoroughbreds of such quality and conformation as the Irish horses of the portraits were available.

Notwithstanding Colonel Grad's recommendation, the use of Suffolk sires, if acted upon, from the nature of things can only result disastrously to the quality and commercial value of our stock on the markets of the world.

Why should a low type of horse be bred that Indian remounts may be obtained readily at a low price? This seems the object the colonel has in view.

The Irish thoroughbreds of the series are on lines of conformation which are incomparably superior for every military purpose of draught or saddle to the Suffolk-*cum*-Belgian lines, and in time, with such sires as those Irish horses available, and the spread of a better knowledge of the principles of breeding good horses, Australia could produce the superior type of horse just as cheaply as the inferior type, and it would be of much greater value on the markets of the world, as it would also be in our industries.

The advocates for having recourse to Suffolk take up a most extraordinary position. We have the established fact that the Shire stock are commercially of more value than Suffolk in the markets of England. We have also the fact that all the highest types of England's utility horses have been raised from the Shire by the use of blooded sires, and never from Suffolk.

It is generally accepted as an elementary principle of breeding that any family or stock more readily blends with and becomes more successfully invigorated by a kindred stock than it does with a stock which may be its contrast. Yet we are advised to place faith in mating the contrasts of Eastern and Belgian types.

Were we desirous of producing horseflesh to supply its consumption in Europe, the recourse to Suffolk-*cum*-Belgian would not be absurd; to do this to breed good horses for utility purposes is so.

Renascence on the superior Eastern lines is required if improvement is desired. We are being urged to renascence of the inferior Belgian lines.

NEW WORK ON THE HORSE.

"The Arab, the Horse of the Future," is the title of a book by the Hon. Sir James Penn Boucaut, K.C.M.G., Senior Puisne Judge of the Supreme Court of South Australia, with a preface by Sir Walter Gilbey, Bart. (Gay and Bird, London). Sir James adds his work to the list of over 4,000 distinct works which Sir Walter Gilbey tells us have been devoted, in various languages, to the horse. It is scarcely necessary to tell our readers that the eminent South Australian is a devoted admirer of the Arab horse. He has proved that, and given to breeders in this country a line of stock which is having a marked effect not only on the courage and stamina of our horses, but also upon their beauty. His book gives unquestionable evidence of the "speed, stamina, and docility" of the Arab, and he replies to the anticipated statement that he is interested in selling the animals he has bred by pointing out that the case of the "thoroughbred" is backed up by "breeders, racing owners, trainers, grooms, jockeys, stable boys, bookmakers, and sporting newspapers, not to mention vets., the makers of racing gear, and the runners of the 'tote.'" Sir James Boucaut and the piles of evidence he produces will probably have as much respect as the persons and things which he quotes. He sets out to show:—1. The general—indeed, almost universal—deterioration of thoroughbred horses both in England and Australia; and if in England, necessarily in Australia, because most of the best sires here have come from England. 2. That the cause of the deterioration is chiefly the breeding for short-race gambling. 3. That the root of the English thoroughbred and all that is good in him is Arab. 4. The excellence of the Arab, and that he has not deteriorated. 5. That the most certain mode of recuperating the breed of saddle and buggy horses, and even of the thoroughbred himself as a real racehorse, would be the infusion of a large amount of pure and fresh Arab blood of the desert breed. He will be a sceptic, indeed, who upon reading this book will persistently disbelieve in the merits of the Arab, and as convincing as anything in it is the sheaf of letters from purchasers of the author's purebred Arab stallions, who express much satisfaction at their young stock. The volume is well written and well illustrated, and it will prove a great joy to those who in season and out of season have advocated the Arab strain, as well as a confusion to the breeders of the weedy five-furlong sprinters, which possess neither strength, endurance, nor temper—unless it be bad temper.—Exchange.

HORSEMANSHIP AND NATIONAL EXISTENCE.

"Loose seat, bad hands, absence of the horseman's get up," or "footiness on horseback." These are the charges that a writer in the "Mark Lane Express" brings against the "casuals" in the British hunting field. He says further, in respect to the British fox-hunter:—"That there is some danger of us losing our pride of place may be admitted, though I don't think the danger is very imminent. But somehow the horseman's traditions are not, I think, quite so much in evidence as they used to be. This may be thought to be a singular remark to make, and one that has little foundation in fact, when the increased size of our hunting fields causes such trouble to masters of hounds, and when there is, perhaps, a greater percentage of hard-riding men than ever there was. But I think in ordinary horsemanship we have deteriorated. No one ever takes even a short journey on horseback now. It a man has to go anywhere, be he country gentleman or be he farmer, he is rarely seen on horseback unless he be middle-aged or past middle age. The younger men take to the bicycle or the motor car, as their purse limits them. Of course, there are plenty of young farmers who ride, but these are almost all to be found amongst those who combine a little horse dealing with the farming."

He then strikes a note which will be taken up by all Australians, amongst whose thousands of good horsemen there are hundreds whose lives are spent

on horseback, and who can sit any animal that ever was foaled. There is little fear of any degeneracy of race in a people whose sons and daughters take as naturally to horses as do South Sea Islanders to breaker-swimming.

"The horsemanship of a nation," he says, "is an important factor in its national existence. Whatever else has tended to the decay of nations, the loss of horsemanship has been one sign of decay which may be said to be infallible. I don't say for a moment that we are well on the downward road as yet, but there does seem a danger of us losing the pre-eminence as a nation of horsemen to which we owe so much; and we should resolutely set to work to do away with the danger. It is not too much to ask that our gilded youth should render themselves proficient horsemen. To their credit many of them do; but they all should. For horsemanship sets the manhood of a nation at a high standard, and therein lies its value in these days—a value which is quite as high now as it was in the days when horses were the only form of locomotion. And there is no reason why horsemanship should not be taught in all our villages. The expense would be little, and the advantage great. It would be of infinitely greater importance for the future groom or ploughman to know how to handle his horse properly than for him to waste paper in bad drawing, for example. And men so taught would form a very useful force in the event of invasion, which, if a remote, is not an impossible contingency."

COFFEE IN BRAZIL.

The question is sometimes asked: "Why is Brazilian coffee cheaper than that of any other coffee-growing country in the world?"

The "Hawaiian Forester" supplies a reasonable answer, as follows:—

The State of Sao Paulo, Brazil, has 1,908,000 acres planted in coffee. There are 545,000,000 bearing trees and 140,000,000 trees that will come into bearing within three years.

Sao Paulo has 4,585,000 acres of land suitable for coffee. Four hundred and twenty thousand labourers are employed during the picking season. The coffee-trees are worth 312,000,000 dollars (£62,400,000). The average yield per 1,000 trees is 2,300 lb.

The methods in use are entirely unlike the Hawaiian practice in coffee-growing. The picking is deferred until the whole crop of cherries has ripened. The labourers then strip the cherry off the branches, allowing fruit, leaves, and twigs to fall on the ground. When the trees have been stripped, the fruit, with dirt, sticks, and stones, is raked into heaps, shovelled into wagons or cars on portable track, and transported to a river, stream, or flume, to be washed in sluice-boxes. These deliver the cherry free from sticks, stones, dirt, and rubbish. The cherry is then transported to huge, open-air drying floors of cement or clay. The sun-dried cherry is run through hulling machinery, graded and polished, and, when bagged, is ready for market.

Santos coffee may, therefore, be produced and marketed at a profit at prices which would drive our Hawaiian growers out of business.

Labour, during the picking season, commands high prices, and there is always a shortage during that period. Even paying the higher prices that labour commands during the busy season, the Brazilian growers can produce coffee at a lower price and still make a profit, because their methods of picking and handling the crop are cheaper than ours. The Sao Paulo method is also better adapted to the needs of the small individual planter, who can market his coffee to the large planters and mill-owners in the dried cherry, practically the only investment of capital, other than his own labour, that is required being the comparatively small cost of a drying floor.

Australian Poultry and Rabbits.

The prices realised for Queensland poultry shipped to the London market, per "Damascus," last year were:—For ducks, 2s. 6d. to 2s. 9d. each; for turkeys (out of season), 7d. to 9d. per lb.; and for best chickens and capons, 3s. 3d. each. These prices were obtained in the open market in competition with poultry from America and different European countries. It comes to us, therefore, as a surprise to find an article in the "Fish Trades Gazette and Poultry, Game, and Rabbit Traders' Chronicle," under the heading "Australian Poultry," commenting on a shipment of Tasmanian fowls being sold in London at 6s. each, goslings 4s. and ducks 3s. 6d. each. The editor of the above journal says:—

"We are not in a position to deny that there may be a substratum of truth in it—some of the ducks and goslings may have made the prices given, but what was the average? As to the fowls, a very few may have been sold at 6s. purely out of curiosity on the part of the buyer, but we should think the average did not reach more than, if so much as, half this amount, less expenses. The best Surrey fowls, which are the goods most sought after by that section of the trade who can pay high prices, never touched more than 5s. 6d. last year, and this on a very few occasions. These goods are unrefrigerated and the very best of the home produce.

"Victoria and New South Wales have both tried their hands at poultry shipping. The goods were perfection, barring the fact of their being refrigerated, and nothing like the figures quoted by our contemporary were ever obtained. We can readily understand the matter; the colonial journals are always well and ably represented in our London markets. Perhaps some buyer—probably a private customer—out of curiosity had paid 6s. each for a very small parcel. The journalist comes along, and is told Tasmanian fowls made 6s. A cablegram goes out to that effect, and the thing is done. The greatest opposition to colonial poultry comes from America, Canada, and Russia—prices such as these would bring all the poultry in the country across the Atlantic, to say nothing of what the Russians would do. This year there may be a better chance for colonial importers; we say may be. It is most possible, and very probable, that the Russian supplies will be unusually low; should such be the case, there would naturally be less competition; but to expect 20,000 birds to be marketed at anything like 6s. each is, in our opinion, about as futile a hope as a colonial could possibly indulge in.

"A member of the trade reminds us of some large parcels of colonial poultry sold in London in March and April last, when not even 2s. each was made of 3 lb. to 4 lb. fowls, and this has been the average experience all through the trade.

"Apropos of this subject we notice in the October number of the 'Agricultural Journal of Victoria' some very concise and correct instructions as to packing and grading poultry for export, written by the Victorian Inspector of produce in London. The writer emphasises that old birds ought not to be packed, because they would come into competition with Russians. This seems to imply that Russian fowls are no better than Victorian old birds. We would hasten to correct such an impression. Russian fowls are now graded with the greatest care, new breeds have been introduced, and we can assure Mr. Peppard that the best class of Russian poultry requires a great deal of beating when compared with other refrigerated goods, as the American shippers know to their cost. The conclusion of the article is, to say the least, amusing. The inspector suggests to shippers that they stick to one agent, and appoint as that agent one who will sell direct to the consumer. This has always been a favourite idea with colonials engaged in the meat trade, who think that their goods are of such fine quality that all the town runs after them, and that it is as easy for a firm to sell 20,000 animals as a dozen; they, moreover, credit the

middleman with getting all the profit out of the deal. Let us look at the real facts of the case. To sell direct to the consumer, the shippers must run a shop for themselves, must dispense with the monetary arrangement of a draft against shipping documents, and then the question arises, will materfamilias come from suburbia to their store to buy her two fowls? Under existing arrangements a large wholesale house, or more probably a firm of merchants having a colonial representative, receives the goods and accords the monetary facilities. They then either sell direct to the trade or consign the goods to salesmen in London and the provinces, who supply their customers (the retail shopkeepers) with their requirements. This is the way the American, Canadian, and Russian trade is conducted, and to recommend any other method is as quixotic as it is ridiculous."

The price obtained by the Queensland shippers was much less than that mentioned for the Tasmanian birds, yet a very good profit was the result. If 6s. each was obtained by the latter, it could only have been, as the "Fish Trades Gazette" says, for a very few, and possibly from a desire on the part of the buyer to surprise his English guests at dinner, by placing before them good chickens raised 16,000 miles away. We, in Queensland, were not led astray by any such sensational report. We have experts in the Department of Agriculture and Stock who are well posted in London prices, and neither they nor the Queensland journals did more than advise poultry-breeders to ship to the home market, where they would obtain a price at certain seasons of the year which would give them a greater profit than if they sold in the local markets. The same very interesting journal gives us some information about the Australian rabbit trade. It appears that in 1905 Great Britain imported 593,515 crates of rabbits from Australia, or a prodigious total of 14,245,080 rabbits! This in addition to 94,231 crates from New Zealand and some thousands of crates from Tasmania. The article concludes as follows:—

"To such of our readers as are interested in scientific theories the contemplated scheme for the destruction of rabbits in New South Wales offers a very pretty problem. A colonial medical man, writing to one of our Australian contemporaries, points out the probability that after a time the virus introduced will lose its efficacy by reason of 'certain individuals of the species exhibiting a variation which will enable them to escape from what has been fatal to the rest of their race.' These, according to the law of the 'survival of the fittest' will form a nucleus, from which a second edition of 'the pest' will be propagated. We are not here concerned in discussing the question, but when questions like this are raised it betokens what is going on with regard to the matter, and we hope such of our readers as may make contracts for this season will again insist on the insertion of a cancellation clause in the case of a scare setting in over rabbits."

A VALUABLE CARNATION.

A seedling of a new variety of carnation, which has been named "The Aristocrat," has been raised by a florist at Cincinnati, U.S.A., who sold it for £8,000. This exceeds the previous highest price given for a new variety of this flower by £2,000. It would appear incredible that such an enormous sum should be given for one plant, but it must be remembered that there are tens of thousands of wealthy and well-to-do amateur horticulturists in the United States as well as in Europe and other parts of the world, not to speak of the great army of professional gardeners, who would willingly pay from 5s. to £1 per plant for a really good new flower. Not so long ago new varieties of potatoes sold at from £3,000 to £300,000 per ton, whilst £50 was offered for a single tuber. The purchaser of the new carnation, with care and good fortune, will in a comparatively short time probably recoup his outlay, and make a considerable profit on it.

Poultry.

The PRODUCTION OF BROWN OR TINTED EGGS.

It is stated in an article in the "Journal of the Board of Agriculture," London, for January, 1906, that a point which poultry-keepers would do well to bear in mind is that, for marketing purposes, brown or tinted eggs are usually more valuable than white ones. In some of the home markets, the highest prices are obtained for eggs which have a tinted shell, and the best class of traders find that these eggs are constantly inquired for by their customers. In spite of the fact, which is perhaps generally acknowledged, that the colour of the shell does not affect the quality of the egg, the preference indicated above exists, and must be taken into account. It is, therefore, desirable to note which breeds produce eggs which will meet the requirements.

The breeds which produce tinted eggs are, without exception, sitters, and of the breeds which are commonly kept the following list includes those which yield eggs of the desired character:—Langshans, Cochins, Plymouth Rocks, Orpingtons, Game, Wyandottes, Brahmas, Faverolles, Coucous de Malins. It addition, there are other breeds which are not kept for egg-production, notably the Indian Game and the Malay. Of the varieties named, the Langshan produces the most beautifully tinted egg, and this perhaps explains why that variety at one time attained such popularity. Unfortunately, some of the breeds mentioned lay eggs which are small in size, but in this connection it must be borne in mind that small eggs may be more acceptable to the consumer if tinted than are larger white eggs. Crosses are frequently made with a view of increasing the prolificacy and at the same time securing larger size generally. This results in the shells being less highly tinted than would otherwise be the case.

In crossing two breeds producing respectively white and tinted eggs, it is necessary to depend chiefly upon the females for conservation of the tinted characteristic, and it is advisable that in such crossing the male only should be selected from the white egg-producing races. The following crosses can be recommended, both for the colour of the shell and the number of eggs so produced:—(1) White Leghorn—Langshan; (2) Ancona—Langshan; (3) Minorca—Langshan. These are given in order of merit. If the colour and size of the egg only be regarded, the last-named cross would no doubt be preferred; but both the Minorca and Langshan are slow-growing and slow-feathering races, and to cross these two breeds confirms a weakness which is in itself objectionable.

Others which may be mentioned are:—(4) White Leghorn—Buff Orpington; (5) Brown Leghorn—Buff Orpington; (6) Minorca—Buff Orpington; (7) Ancona—Buff Orpington. Of these, the best in point of size is the Minorca cross, but the White Leghorns are hardier, and yield rather more vigorous chickens. One great advantage of the Brown Leghorn—Buff Orpington cross is, that in the colour of the plumage there is greater uniformity in the chickens than would otherwise be the case. A White Leghorn—Plymouth Rock cross is of great value, as both the parents are very hardy and active, and, although the colour of the eggs produced may not be so deep as in some of the crosses already named, yet it is sufficiently so to meet the market demands.

In the case of a Minorca—Wyandotte or a White Leghorn—Wyandotte cross, the object is to ensure a larger size in the egg, because the Wyandotte, although a prolific layer, produces eggs which are distinctly small, and in crossing it is desirable to remedy this weakness. The cross between the Minorca and the Wyandotte would ensure a much larger egg.

One great advantage which all breeds producing tinted eggs possess is that they are in general better winter layers than the varieties producing white-shelled eggs, this being perhaps due to the fact that they are usually very good sitters and mothers, and so obtain a rest during the spring and summer months.

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CAPONISING.

Veterinary Surgeon Elley, of the Department of Agriculture, Cape Colony, who is an expert in this operation, thus describes his method of procedure:—

The advantages of this simple operation are many, though often entirely overlooked by the poultry breeder and feeder. They may be briefly summarised as follows:—(1) The quality of the flesh is greatly enhanced, and this improvement remains even though the capon is not killed until he is two or three years old; (2) in countries where caponising is regularly practised, capons invariably fetch three to four times the price of cockerels; (3) the size and weight of the bird are often doubled; (4) the capon is fattened and ready for market in half the time which is required to prepare the cockerels, and with much less food; (5) a capon, if required, will look after a greater number of chickens than the average hen. The disadvantages, with the exception of small mortality, seldom more than 1 to 2 per cent., from the operation, are practically *nil*.

Age to Operate.—About three months, or as soon as the sex can with certainty be ascertained. Preparation for Operation: Light, soft food, forty-eight hours before operation, and complete fast during the last twenty-four hours. Instruments Required: Sharp pointed scalpel or bistoury. Spreading forceps. Extracting forceps or spoon. Two pieces of soft cord or thin rope about 30 inches long, arranged with a running loop at one end and a weight of about $1\frac{1}{2}$ lb. at the other. A barrel placed on end forms a convenient operating table.

The Operation.—Place the cockerel on the operating table, lying on his right side, though which is operated on is a matter of no importance. Pass the running loop of one cord round both legs, and allow the weight to hang over the side of the table. Pass the loop of the second cord round both wings, close to the body, allowing the weight of this cord to hang over the opposite side of the table. The legs and wings are thus removed out of the way of the operator and held motionless. Damp the feathers of the left side, and pluck out those covering the last two ribs. Feel for the last rib; the seat of operation is immediately in front of this bone. Before making the incision, draw the skin from behind forwards, so that when released after the operation is completed the opening into the abdominal cavity may be covered.

With a sharp scalpel make an incision about 1 to $1\frac{1}{2}$ inches between the last two ribs, cutting obliquely away from the backbone towards the breast bone—that is, following the course of the ribs. Introduce the spreading forceps between the ribs, and regulate them so as to part the ribs sufficiently to allow the extracting forceps or spoon to be introduced. The peritoneum or thin skin covering the intestines will now be exposed, and must be carefully cut through with a clean sharp knife. The testicles will now be sighted as two small grey ovoid bodies situated one on either side of the backbone, immediately in front of the kidneys. Introduce the extracting forceps or spoon and secure the lower testicle and remove it, cutting or breaking the cord as high as possible. After which remove the upper testicle in a similar manner. The lower testicle is removed first lest the slight hæmorrhage which the operation occasions should obscure it if the higher one were removed first. Both testicles being removed, take out the spreading forceps and allow the ribs to come together, and if the skin has been stretched before the incision was made it will retract and cover the wound into the abdomen. In this it is quite unnecessary to stitch the wound, but, should the operation have been roughly performed and a large wound made, it may be advisable to put one silk suture through the skin.

When operating upon a large number of cockerels it often happens that a few "chasers" or "slips" develop, the result of too much of the cord, or even part of the testicle itself, being allowed to remain. Care in the operation can alone prevent this, but when it does happen a second operation can always be performed, and it is best to make the incision on the opposite side. It should not be necessary to mention even to the most amateur operator that in opening into the abdominal cavity the utmost cleanliness is absolutely necessary.—"Agricultural Journal of the Cape of Good Hope."

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order SOLANACEÆ.

PHYSALIS, Linn.

P. virginiana, *Mill. Gard. Dict.* Stems 1 or 2 ft. high, from deep creeping subterranean roots, dichotomously branching, angular, spreading or decumbent, with more or less viscid hairs. Leaves 2 to 3 in. long, tapering gradually into the petioles, entire or repandly toothed, sometimes in twos. Peduncles slender, about ½-in. long, solitary, nutant. Calyx more or less hairy, lobes narrowly triangular. Corolla about ¾-in. diameter, of a dull sulphur-yellow, with a dark centre. Anthers yellow. Berry yellowish, about ½-in. diameter, acid, and said to be edible, but far inferior to the Cape gooseberry. According to Dr. Asa Gray, *P. heterophylla*, *P. nyctaginea*, and *P. viscido-pubescens* of Dunal belong to this species.

Hab.: The above North American plant has been introduced, probably with other seeds, and is said to be spreading on cultivated land at Gatton. On account of its deep-spreading roots, which form plants a distance from the first stem, this plant, if not checked, may become a troublesome weed.

Order EUPHORBIACEÆ.

Tribe Euphorbieæ.

EUPHORBIA, Linn.

Sect. Anisophyllum.

E. carissoides, *Bail. sp. nov.* (Plant somewhat resembling one of our Carissas.) A glabrous and glaucous, dichotomously branched undershrub. Leaves opposite, shortly petiolate, in somewhat distant pairs, cordate-ovate, usually mucronulate; the basal lobes nearly equal, about ½-in. long; the marginal teeth distant, irregular, most prominent towards the base, somewhat coriaceous. Stipules consist of one or more subulate coloured lobes, the central and longest scarcely exceeding 1 line. Flower-heads terminal, solitary, on short pedicels soon in the forks from the elongations of the shoots. Involucre about 1 line long, smooth, glaucous; the glands very hairy on the face towards the base, rather broad, with a prominently lobed white border; ovary rugose and prominently 3-angular. Styles 3, entire. Fruit not seen. This new species seems closely allied to the north-western *E. myrtoides*, Boiss. Benth. in Fl. Austr. VI., 50.

Hab.: Near Herberton, *R. C. Ringrose.*

Order GRAMINEÆ.

PANICUM, Linn.

Series Echinochloæ.

P. frumentaceum, *Roxb.*, Fl. Ind. I., 304. A leafy, succulent, many-stemmed grass. Stems 3 to 6 ft. high, more or less compressed. Leaves large, often over-topping the panicles, margins hispid; ligula irregular, often wanting. Panicle erect, oblong, composed of numerous more or less incurved spikes, hairy at the base, entirely surrounding the common rhachis, at times forming verticles. Spikelets crowded in clusters, often in threes—one sessile, the other

two on short pedicels. Glumes slightly hairy, margin ciliate, acute, 3-nerved, outer one scarcely half the length of the 2nd and 3rd; fruiting glume smooth and glossy.—*P. grossum*, Salisb.; *Oplismenus frumentaceus*, Kunth.; *Echinochloa frumentacea*, Link.

Hab.: Hook., in Fl. Brit. Ind., says: "Cultivated in the hotter parts of Asia and Africa." Others say that it will stand the cold of Northern Europe. In this State it has made its appearance at Mount Berryman, Laidley, and made a most luxuriant growth, stems 6 feet in height, tender to the base, and should prove a valuable addition to our fodders. It is closely allied to both *P. colonum* and *P. crus-galli*, and is sometimes given by botanists as a variety of the one and sometimes of the other; all three grasses produce, under cultivation, excellent fodder in this State; but the one under notice yields the most useful grain, and is quite equal, if not superior, for fodder. Roxburgh says: "The seed is wholesome and nourishing, and cattle are fond of the fodder." J. F. Duthie: "It is largely cultivated in Northern India, and it is a rapid grower, coming to maturity within six weeks after sowing." The plant was introduced fully twenty-five years ago by the Queensland Acclimatisation Society; and it might then be seen growing in their garden, Bowen Park.

REFERENCE TO PLATE.

A. Ripe panicle.
B. Upper portion of stem.
C. Lower portion of stem.
D. Transverse section of stem.

THE PREPARATION OF CANE FOR THE MILL.

It has been the dream of sugar engineers for a century to provide some satisfactory auxiliary machine to prepare sugar-cane for the more complete extraction of its juice by the cane-mill process. The defibreur utilised in the French West Indies was an attempt in this direction. Hay and feed cutters were made large and strong, and applied to this work with more or less success, and some of these cutters of the Ross type are still in use in Java. The present Newell shredder, a very excellent machine, and doing fine work in scores of sugar-houses, is the outcome of long experimentation in this direction. The Krajewski crusher is perhaps the present chief favourite apparatus for this work, and hundreds of them are in use in the cane-sugar world.

That there is room for improvement has been demonstrated at the Braithwaite sugar-house in Plaquemines parish, where the general manager, Mr. P. Campbell, a gentleman of large experience and great ability, recognising the difficulty of securing an even and homogeneous cane-mill feed, even with his splendid double mill and Krajewski crusher, conceived the idea of reducing the roughness and inequalities in the cane-mill feed by cutting up the lumps or high spots with a series of rapidly moving saws. He designed this mechanism, and the result has been an unqualified success.

The Braithwaite mill is now grinding 1,000 tons of cane per day, except when the supply fails, and heavy, rough feeding of the cane-carrier is almost a *sine qua non* under the circumstances. This feed is cut up, flattened out, reduced in height, and excellently well prepared for the crusher and the mill, the capacity of which is largely increased thereby. Mr. Campbell may well be proud of his invention, and we have no doubt other planters will arrange with him for the use of his apparatus.

We desire to say that while Mr. Campbell is the inventor and designer of the saw apparatus, he owes much to Mr. de Quede, the well-known engineer of the Wilmot Machinery Company, New Orleans, for suggestions as to the mechanical installation of the apparatus. This Mr. de Quede has done in excellent shape, and is now driving the machine with a modern rope drive from the rim of the crusher fly-wheel. The whole apparatus works as well and smoothly as a Jurgenson watch, and its effectiveness is of equally high order.—"Louisiana Planter."

Plate XXIV.

Panicum frumentaceum, *Roxb.*

Neglected Industries.

GINGER.

Here we have another article which is in universal demand, and for which good prices can be obtained. Ginger grows to perfection in any suitable soil on all the coastal lands of the State. There is no more difficulty in growing ginger than in growing arrowroot, peanuts, castor oil, or sunflowers. There is, to be sure, a considerable amount of light labour required to prepare the rhizomes for market, but the preparation is so easy that it can be done by girls and boys.

Two essential requirements for the growth of the plant are—sunshine and moisture. These conditions are found in Eastern Queensland. The process of planting differs little from potato-planting. A "finger," containing an eye or embryo, is planted in holes or trenches a few inches beneath the surface, about 1 foot apart. All that is needed is to keep the ground clean, and the young plants well watered, the soil being, of course, well drained, because stagnant water gives rise to black rot; and in this condition the root fills with water, swells, has a bad smell, and is then attacked by insects and worms.

The very highest quality of ginger is produced on deep, rich, black scrub or virgin forest soil. It can be grown year after year on the same ground, and when the soil becomes too poor to grow "white ginger" an inferior variety—the blue—will yield good crops.

More depends on the curing of the ginger than on the soil, and regularly shaped "hands," as the roots are called, command the highest price in the market.

Planted in October, it is ready for digging in July or August. When the stalk withers it is ready for harvesting. In digging out the roots they must be carefully turned out with a fork without bruising or breaking the hands. These hands are divested of fibrous roots and of all adhering soil, and this must be done as soon as they are dug, for, if allowed to dry with soil, &c., adhering to them, the ginger will never be white. After cleaning, the roots are thrown at once into water, and are ready for peeling.

The peeling is an art easily learned. As the oil cells on which the aroma of ginger depends are close to the surface of the root, the peel must be very thinly taken off with a narrow-bladed knife. As fast as the roots are peeled they are thrown into water and washed. A very little water will serve to wash a great deal of ginger. The roots remain in the water all night. Limejuice in the water will give a whiter root. By using boiling water the peel comes off easily, and what is known as black ginger commercially is produced.

After washing, the roots are dried in the sun on mats or boards laid on the ground. They are exposed at sunrise and turned over at mid-day. At sunset they are taken in or carefully covered, as rain or dew causes mildew. It takes about six or eight days to thoroughly dry them. When dry they are graded or sorted. The highest grades are large-sized hands of light, uniform colour, free from evidence of mildew. This grade is very brittle and cracks easily, but they must not be broken, or the value is depreciated. There are generally four or five grades, that which is shrivelled and small being in the lowest. The dark varieties form another; the heavy, tough, and flinty, a third. These four are finally assorted by placing hands which are small but of good texture and colour as one grade; the larger-sized, well-bleached hands are placed in the highest grades. The finest hands will range in weight from 4 to 8 oz. Ginger is always packed in barrels for shipment.

As to yield and profit of the ginger crop, these depend, like all other soil products, on soil, rainfall, sunshine, planting, care, and curing. An average yield can be estimated at from 1,000 to 1,500 lb. dried ginger per acre; 2,000 lb. have often been obtained.

Prices for ginger vary. As much as £10 per cwt. is often paid in the London market for the very highest class of white ginger, but the usual market price to-day averages all round from £2 2s. to £3 10s. per cwt. for Jamaica ginger, the same for Cochin, and 18s. to 18s. 6d. per cwt. for Japanese.

Now in all this there does not exist a single reason why ginger should not be grown by any farmer who has suitable soil in a suitable locality, and especially by those who, like the Hatton Vale farmer, are blessed with a family of fourteen boys and girls. Think what a lot of ginger they could prepare of an evening setting round the fire on an August night, in the same way as forty-five years ago the farmers' wives and children and the farm hands used to prepare arrowroot, grating the roots into tubs and buckets on graters made of kerosene tins. Arrowroot was worth from 1s. 6d. to 2s. per lb., and it paid to prepare it by hand. How much better would it pay to prepare ginger, so easily grown, so prolific, so easily cured, due care being exercised, and for which, in the United States alone, there is an annual demand for over 3,000,000 lb., leaving Great Britain and other European countries out of the calculation.

COTTON-GROWING.

When the highly remunerative result of the cotton crop of 1905 is considered, it seems extraordinary that cotton-growing should this year once more have to be reckoned amongst the neglected industries. If all the men on the land were dairy farmers, we could easily understand that fodder crops would claim all the available arable land. Those who are now devoting their energies to raising lambs for export would also not be likely to touch cotton. But there are hundreds of farmers who devote their land to the ordinary farm crops, some of which, in such magnificent seasons as have now returned to Queensland, and which, according to meteorologists, will continue for a cycle of years, scarcely pay for the labour of cultivation, preparation, and marketing. To such men the business of cotton-growing should appeal with much force. They appear to fear that the price of cotton will fall to a non-paying point about the time when their crop would be ready for market. But what are the facts? What prospect is there of a fall? The cotton-growers of the United States have again had a short crop. The estimated 12,000,000 bales for 1905-6 will not be realised by at least 3,000,000 bales, and of a 9,000,000-bale crop an immense proportion is used in the American cotton mills, which are yearly increasing in numbers. England must have cotton, so must Germany and France. If America cannot supply it, it must be got elsewhere. But from what country? From India? From Africa? From the West Indies? From Egypt? Let us take India. Large quantities of cotton are produced there certainly, but, although thousands of pounds sterling have been expended in attempts to produce a cotton such as any Queensland farmer can produce, failure has constantly been recorded, and lately India has had recourse to Queensland to obtain seed of a variety which in this State succeeds well in the North, whilst in all probability it will share the fate of all other imported varieties in India. We allude to the two Caravonica varieties grown by Dr. Thomatis, at Cairns. That gentleman has lately sent large quantities of seed to India—we cannot say at what price, but rumour has it the doctor's cotton seed is proving a mine of wealth to him. As a rule, Indian cotton is short in staple and rather coarse, and consequently does not fetch a high price in the English market. The annual output of Indian cotton is about 3,000,000 bales of 500 lb. each. As to Africa, good cotton can be grown there, but, in spite of the supposed cheapness of native labour, late accounts state that owing to labour troubles cotton-growing in some parts has had to be abandoned. In the West Indies practically only one kind of cotton is grown—Sea Island, which always brings a high price. But the range of Sea Island cotton is limited, and the demand for it can scarcely be supplied by the West Indies and the American

Sea Islands together. The total world's production of Sea Island cotton is only 110,000 bales, of a value of £100,000. In Queensland, Sea Island cotton can only be grown successfully on the coast, particularly in the Northern districts. Inland from Brisbane, Maryborough, Rockhampton, and Townsville westwards, the Upland cotton must be grown. Egyptian cotton has always been famous for its excellence, both of colour, length of staple, and fineness; but of late the value of Egyptian cotton has much deteriorated owing to carelessness on the part of the growers about the seed. Different varieties have been sown in the same field, with the result that produce is mixed, and therefore not so valuable as it used to be. Egypt exports about 290,000 tons of cotton annually and 17,000,000 bushels of cotton seed. Exclusive of these—America, Egypt, and India—the rest of the world produces about 1,000,000 bales of 500 lb. each. The present annual production of cotton all over the world is about 16,000,000 bales, whilst the present demand far exceeds this, and in two or three years it is estimated that the demand will reach 19,000,000 bales.

All this goes to show that there is no present prospect of a low price for the raw material, and that an excellent market is awaiting all the cotton which can be grown in Queensland. To produce an acre of cotton entails far less labour than to produce an acre of maize. The value of the produce of an acre of maize is about £6, from which has to be deducted the cost of cultivation, husking, threshing, and bags. An acre of well-grown Uplands cotton is worth, at 1½d. (£6 10s.) to 2d. (£8 16s. 8d.) per lb., from which has to be deducted the cost of cultivation and picking. An acre of Sea Island cotton is worth double this. If farmers would ponder this matter and plant a few acres of cotton every year, it would not be long before a large export trade would arise, and, like sugar, cotton would become one of the chief staple products of the State.

Tropical Industries.

QUEENSLAND ARROWROOT.

About six years ago much correspondence passed between the Department of Agriculture and Stock in this State and the then Agent-General for the State in London on the subject of the sale of Queensland arrowroot manufactured from Tous-les-mois *(Canna edulis)* in the United Kingdom. Under the provisions of the Food and Drugs Act, arrowroot made from *Canna edulis* may only be sold in Great Britain when labelled "Queensland Arrowroot." The Hon. A. J. Thynne, when Minister for Agriculture, advised growers not only so to designate the article, but to add the words "Prepared from *Canna edulis*," and so the matter stands at present.

ANALYSIS OF ARROWROOT FROM CANNA EDULIS, MANUFACTURED BY MESSRS. HARDING BROS., OF KALBO, GERALDTON, NORTH QUEENSLAND.

Early last month this Department received from Mr. Howard Newport, of the State Nursery, Kamerunga, 5 lb. of arrowroot made from the *Canna edulis*, being a sample of a bulk lot made by Messrs. Harding Bros. The sample was submitted to the Agricultural Chemist, Mr. J. C. Brünnich, who has furnished the following report on it:—

	Per cent.
Moisture (at 100 degrees C.)	17·28
Ash	·29
Proteids	·06
Starch (of which 4·3 is soluble starch)	81·87
Fibre (by difference)	·50

The analysis shows this sample of arrowroot, which represents a bulk sample of from 20 to 30 tons manufactured by Messrs. Harding Bros., Geraldton, from *Canna edulis*, to be a starch of excellent quality and high purity, which, treated with boiling water, forms a paste of very high viscosity. The starch grains are of fairly uniform size, and the product has a nice silky appearance. This arrowroot differs chiefly from Bermuda arrowroot in containing much less insoluble fibre in its composition.

J. C. BRÜNNICH, Agricultural Chemist.

BANANA-GROWING.

Notwithstanding the disaster which a few months ago befel the banana plantations in North Queensland in the shape of a devastating hurricane, there is reasonable ground to believe that the damage was not quite so serious as was anticipated. Early in March 7,000 bunches and many crates of bananas were shipped from the devastated districts. The magnitude of the Queensland banana trade may be learned from the following figures showing the shipments from Geraldton alone. We have omitted the item of freight, which is, as may be supposed, a considerable factor in the expenses:—

RETURN OF BANANAS SHIPPED FROM GERALDTON FROM 1ST JANUARY, 1901, TO 31ST DECEMBER, 1904

(From November, 1903, the Ports of Ella Bay and Liverpool Creek are included; previous to November, 1903, Bananas are from Geraldton only.)

—	Year ending December, 1901.	Year ending December, 1902.	Year ending December, 1903.	Year ending December, 1904.
Bunches, Melbourne and Sydney	657,525	692,905	818,900	1,257,446
Cases, each 4 Bunches, Adelaide	91,660	166,816	79,704	109,872
Crates, each 25 Bunches, Queensland ...	566,175	374,354	418,895	320,220
Total Bunches	1,315,360	1,234,075	1,317,499	1,687,538

RETURNS SHOWING SHIPMENTS OF BANANAS FROM THE PORTS OF GERALDTON, ELLA BAY, COWLEY, AND TULLY RIVER FOR THE YEAR 1905.

—	Geraldton.	Cowley.	Ella Bay.	Tully River.
Bunches to Sydney and Melbourne ...	836,091	192,059	71,193	88,309
Cases to Adelaide	50,415	1,878	5,457	4,452
Crates to Queensland Ports	12,225	2,921	1,711	335
Total Bunches	898,731	196,858	78,361	93,096
Cases Oranges to Queensland Ports ...	...	...	...	1,860

VALUE OF FRUIT AND TIMBER, 1904 AND 1905.

	1904.		1905.
Fruit Value	£126,564	...	£129,134
Value of Timber (Cases)	3,400	...	4,792

NOTE.—The cases, which are made of silky oak and maple, are sold in Sydney, Melbourne, and Adelaide. Crates of rough silky oak, which have contained bananas, may be bought in Brisbane at from 4d. to 6d. each.

PROFITS OF BANANA-GROWING.

We are not in a position to state the profit made by banana-growers in Queensland, but it probably approximates the profits made by West Indian planters, as elicited by Mr. W. E. Smith, general manager of the Trinidad Railway, who was sent by the Agricultural Society of Trinidad to inquire into

and report upon the methods of handling, transporting, and shipment of bananas and oranges in Jamaica, and in his report he gives some figures as to profits which are interesting. He took an estate of 300 acres, of cultivated cane land principally, which had been in cultivation about three years. The cost of clearing and preparing the land—ploughing, planting, weeding, and pruning—was a little over the average of £10 per acre. The initial expenses were fully realised with the first fruiting, after which the net clearance each year amounted to not less than £10 per acre. This is typical of many estates, both where irrigation is carried on and otherwise. An acre of bananas planted, say, 14 feet by 12 feet, will give roughly 250 plants, or three stems to each stock. Under good tillage and with average luck, these should produce not less than 300 bunches annually, extending over the ratooning period, which varies from three to six years. To be on the safe side, take 260 full-paying bunches, which realise an average price of 1s. 6d. The gross revenue comes to £19 10s., and after deducting say 45 per cent. for general management, including propping the fruit stems, reaping, carting, and interest on capital, the net clearance is not less than £10 per acre.

One hundred acres of bananas in full bearing, under average conditions of soil, cultivation, and rainfall, would therefore mean an income of £1,000 a year. Mr. Smith, who is in charge of the Trinidad section of the exhibition at the Crystal Palace, says he should be inclined to say that these figures, which applied to last year, should now be reduced by 25 per cent., owing to the reduction in prices consequent upon the monopoly that has been established. But, even if this reduction be made, a profit of £7 10s. per acre is a very handsome one.

MAGUEY CULTIVATION IN MEXICO.

The maguey plant, also called "century," "yaxci," or "henequin," is a species of the genus Agave. The fibre, after being extracted, is generally known as sisal, ixtle, or henequin. This fibre is mostly shipped to the United States, where it is manufactured into sacking, cordage, and binder twine, the finer qualities being used for making fancy hammocks and other similar articles. Yucatan leads all the States of Mexico in the production of the Maguey plant. This new enterprise is making this State one of the wealthiest in the Republic, and it is outstripping any similar industry in point of rapid increase.

The maguey plant is found in its wild state in many of the States of Mexico. It thrives on poor, rocky lands, where scarcely anything else will grow. The climatic conditions of Mexico are very favourable for the cultivation of maguey. A machine for the extraction of maguey fibre, which is in general use, and which gives very good satisfaction, is manufactured in Mazatlan. This machine weighs 850 kilos (1,870 lb.), and costs, ready for shipment, 350 dollars (£35) Mexican, and with cap or cover 450 dollars (£45). It will strip about 7,000 leaves in a day of ten hours, which should yield 14 arrobas (350 lb.) of fibre.—"The Philippine Bureau of Agriculture, Press Bulletin No. 1."

CHARACTERISTICS OF TRUE SISAL HEMP.

The true sisal hemp of commerce is known to botanists in two varieties, named *Agave rigida, var. elongata*, and *Agave rigida, var. sisalana*, respectively. The former of these is the principal sisal plant of Yucatan, the latter that of the Bahamas, and the general opinion seems to be that the sisalana variety is the best. Plants of the former variety introduced direct into Sylhet from Yucatan have not been very luxuriant, and for the Indian tea districts the sisalana variety has hitherto proved to be preferable.

This variety may be described as possessed of only a very short trunk, with straight stiff leaves, from 4 to 6 feet long and 4 to 5 inches wide. These

leaves have a bloom upon them, giving them a blue tinge, but when this is rubbed off they are dark-green in colour, much greener than the large common blue aloe of the north-west. The edges of the leaves in a typical plant are smooth, without thorns, or with thorns so small as to be hardly noticeable. But this character of thornlessness is an extremely variable one. The young bulbils and plants for the first year of life often, in Sylhet, at any rate, show decided thorns on the side of the leaf, which disappear, or nearly so, as the plant becomes older. More than this, it is not at all uncommon for plants raised from bulbils of a thornless plant to possess thorns throughout life, and to be indistinguishable (until the flowering stage) from the Yucatan variety—*Agave rigida, var. elongata.* The spine at the tip of the leaf is an exceedingly strong one, often twisted, and purplish black in colour on all the plants.—"Sisal Hemp Culture," by H. H. Mann and J. Hunter.

RUBBER IN THE STRAITS SETTLEMENTS AND BRITISH SOLOMON ISLANDS.

The Consular report for 1904 on the Straits Settlements states that a few Para rubber estates were started recently in Singapore, but it is hardly likely that these will increase to any great extent, as there is not much land suited for this cultivation. In Province Wellesley and Malacca, however, there is a marked increase in rubber cultivation, and still more so in the Federated Malay States. The area under cultivation now in the Peninsula is very large, and the prepared rubber is in great demand by the home manufacturers, the best samples having taken the highest price ever paid in 1904—viz., 6s. 1½d. per lb. An extensive series of experiments was carried out last year in the Botanic Gardens to discover improved methods of tapping and preparing rubber. A report on the British Solomon Islands, recently issued by the Colonial Office, states that a recent attempt to procure plants of rubber (*Hevea braziliensis*) from Singapore was unsuccessful, but has only postponed for a few months the commencement of rubber-growing. Many thousand acres of forest lands in the Protectorate are eminently suitable for this purpose, and the climate would appear to be favourable.

COTTON-PICKING MACHINE.

It would appear from the statements in the American journals that the lately invented cotton-picking machine has proved a success. It is said to be largely used in the cotton-growing States of Georgia, Alabama, Louisiana, and Mississippi, and is capable of picking 200 lb. of cotton per hour, or from 2,000 lb. to 2,400 lb. per day. Five men are required to operate the machine, one being the driver and the other four seated on it each work two mechanical aluminium arms 4 feet long. An endless belt of cloth and rubber moves along each arm at the rate of 360 feet per minute. This belt is studded with hooks, the slightest contact with which is sufficient to remove all the fibre from the boll. The cotton passes rapidly along the belt till it reaches a brush, which sweeps the lint into a receptacle prepared for it. By the use of this machine the great cost of cotton-picking will be enormously reduced. The southern cotton States pay £20,000,000 annually in wages to cotton-pickers. Another point especially interesting to Queenslanders is that the labour of a few white men would supply the army of coloured men who, under present conditions, would be required to work large cotton plantations in Northern Queensland. With up-to-date implements for cultivation and the cotton-picking machine, cotton-growing may yet be entered upon on a large scale in the North as well as in the Western country.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

Ninth Lesson.

Heavy Metals.—Iron, Copper, Lead, Zinc, Tin, Mercury, Silver, Gold.

Iron, Fe.—This most useful of all metals is found widely and abundantly distributed in Nature. Native metallic iron is found in meteorites, metallic masses which occasionally fall from the sky to the earth. The most important **iron ores** are the *oxides:* **Magnetite** or magnetic iron, and red and brown **Hæmatite**; and the *carbonate:* **Spathic Iron ore,** which, mixed with clay, is found as **clay iron stone.** Numerous compounds with other elements exist, of which I will only mention the well-known sulphur compound: **Iron pyrites or mundic.** Iron compounds are found in all soils, and cause the red, yellow, brown, and blueish colour.

Iron is a white, lustrous, malleable metal, which at red heat becomes soft, and can be welded. Iron fuses only at a very high temperature. Iron is attracted by a magnet. Moist air, with the help of carbonic acid gas, acts on iron, which becomes coated with **rust.** Iron is readily produced from its ore by *reduction,* which means taking away the oxygen. This process is carried out in a very large scale in ironworks by heating the ores with coal or coke and limestone in blast furnaces. This process can be repeated on a small scale (*Experiment 70*) by heating a little powdered hæmatite (red oxide of iron) mixed with a little soda placed on a piece of charcoal in the blowpipe flame. Little globules of iron will be obtained, which are attracted by a magnet. The carbon reduces the iron $2Fe_2O_3 + 3C = 3CO_2 + 2Fe$, the soda acts as a *flux* and prevents the reduced iron being oxidised again by the hot blowpipe flame. The iron smelter adds limestone to the iron ores before mixing them with coal or coke, the limestone acts in similar manner as a flux forming with the clay and sand in the ore an easily fusible glassy **slag,** which protects the pure reduced molten iron from oxidation. The iron is obtained from the blast furnaces in large bars, called **pig iron,** by simply running the molten metal into shallow moulds made in sand. This product is **cast iron,** which contains various impurities as sulphur, phosphorus, silicon, &c., and always from 3 to 5 per cent. of carbon. This carbon is partly in combination with iron and partly present in the form of minute scales of graphite, which gives the iron a peculiar grey colour. Cast iron, on account of the impurities, fuses at much lower temperature than pure iron; it is much harder, but brittle, and not so malleable. By purifying the cast iron and removing the impurities, sulphur, phosphorus, silicon, and part of the carbon, **wrought iron** and **steel** are obtained. Wrought iron contains only about one-tenth per cent. of carbon, and steel from $\frac{1}{2}$ to 2 per cent.

Cast iron is changed into wrought or **bar iron** by the processes of refining and puddling, in which air is forced through the molten metal, the carbon is burned off and the impurities removed as slags. Cast iron shows on breaking a crystalline structure, wrought iron has a fibrous structure, which accounts for the greater strength of bar iron. Wrought iron is very malleable, becomes soft and plastic when heated, and two pieces can be joined together or *welded* in this state. Continuous vibration can change the structure of iron, and this accounts for sudden breaking of railway truck axles and iron bridges. Bar iron fuses

only at a much higher temperature, and when heated and suddenly cooled does not become harder. Impurities affect the quality and properties of the iron. Steel holds an intermediate position between cast iron and wrought iron, and can be prepared by suitable treatment from both. In the *Bessemer process*, pig iron is treated in large pear-shaped vessels (converters), in which a powerful blast of air is forced through the molten metal. The metal is protected by a slag, which is produced by lining the vessels with fireproof materials, made by calcining dolomite, a mixture of lime and magnesium carbonate. Lime is also generally added, and all this produces a flux which acts on the impurities in the iron and combines with the phosphorus forming the already mentioned **Basic Slag** or **Thomas phosphate.** In a finely ground state this slag, the by-product of the steelworks, is used as manure, containing from 15 to 19 per cent. of phosphoric acid. This steel **(cast steel)** has a crystalline structure. Hard steel or **tool steel** is prepared from bar iron by adding more carbon to the pure iron. Steel, when heated and suddenly cooled, becomes extremely hard. At different temperatures the steel assumes various colours from yellow to orange, purple, and blue; and, by cooling the steel at different temperatures, judged by these colours, different degrees of hardness and elasticity are obtained; this is called *tempering steel.*

Iron forms two series of compounds—namely, **ferrous salts,** in which iron is bivalent $Fe=$, and **ferric salts,** in which it is trivalent $Fe\equiv$.

The former compounds are detrimental to plant life, and only the latter are suitable as a plant food. All plants and animals require iron, but very small amounts are generally sufficient. The plants require iron in the formation of the green colouring matter *chlorophyl.* Plants grown without traces of iron salts have an unhealthy whitish or yellowish colour, which is at once improved by adding iron, even by sticking only a few rusty nails into the soil near the plant roots. To animals iron is necessary for the formation of the *red blood corpuscles.* The dangerous ferrous compounds are easily changed into the beneficial ferric compounds by oxidation, and in soils the process takes place readily if the soil is porous and allows the air to enter. Swampy and wet soils frequently contain ferrous compounds; again such compounds are frequently found in the subsoils, and cause sudden dying off when the roots of plants reach these lower levels. Crops of oats and beans are known to fail suddenly in Scotland—"they have gone to Auchtermuchty"—when the roots of the fine-looking crop eventually reach a wet iron subsoil. Soils very rich in organic matters (humus) may, if wet, cause the formation of injurious ferrous compound from ferric compound, which only can be prevented by liming such soils, by deep cultivation, and by artificial drainage.

Ferrous compounds.—**Ferrous hydroxide,** $Fe(OH)_2$, is obtained by adding a few drops of a solution of caustic soda to a solution of the well-known *green vitriol, sulphate of iron, copperas,* or **Ferrous sulphate** ($FeSO_4.7H_2O$), when a dirty white precipitate is obtained, which quickly changes into green and brown by oxidation into ferric hydrate (*Experiment 71*)—

$$2FeSO_4 + 2NaOH = Na_2SO_4 + 2Fe(OH)_2.$$

The crystals are generally covered with a rusty-looking layer of ferric hydrate, and, in order to show the white precipitate, they will have to be washed before being dissolved. **Ferrous carbonate,** *Spathic Iron ore,* $FeCO_3$, is frequently found in wet soils, and also dissolved in mineral waters (*chalybeate waters*), which deposit rust when exposed to the air. The formation of rust in drainage water will always be an indication of injurious iron compounds in a soil.

The action of lime on iron sulphate is shown by an experiment in which at first a whitish precipitate of ferrous hydrate is formed, which changes quickly into the brown ferric hydroxide (*Experiment 72*)—

$$FeSO_4 + Ca(OH)_2 = CaSO_4 + Fe(OH)_2\text{—ferrous hydrate;}$$
$$Fe(OH)_2 + H_2O + O = Fe_2(OH)_6\text{—ferric hydrate.}$$

Ferrous sulphate, *green vitriol* ($FeSO_4 + 7H_2O$), is obtained by roasting of iron pyrites, and also when iron filings are dissolved in dilute sulphuric acid. It is used in the manufacture of inks and black dyes. With tannic acid, the active tanning substance found in oak bark, wattle bark, mangrove barks, &c., it produces greenish and bluish-black colouration. (*Experiment 73.*) Green vitriol is used as a disinfectant, and a solution of iron sulphate destroys bad smells when poured into drains and sinks.

Ferric compounds.—**Ferric hydroxide,** $Fe_2(OH)_6$, and **Ferric oxide,** Fe_2O_3, are found in considerable amounts in our red volcanic soils. These compounds are of great importance in the household of Nature, as they are not only necessary as a plant food, but they help by preventing putrefaction and absorbing injurious gases and acids (as humic acid); they further aid in the formation of nitrates from ammonia salts, and in the oxidation of organic matters.

When iron sulphate is strongly heated it decomposes, giving off pungent vapours of sulphuric and sulphurous acids, and leaving a reddish-brown powder of ferric oxide, Fe_2O_3, *jeweller's rouge* or *coleothar* (*Experiment 74*)—

$$2Fe_2SO_4 \text{ calcined} = Fe_2O_3 + SO_3 + SO_2.$$

This oxide, dissolved is hydrochloric acid (*Experiment 75*), forms a yellow solution of **Ferric chloride,** Fe_2Cl_6—

$$Fe_2O_3 + 6HCl = Fe_2Cl_6 + 3H_2O.$$

Addition of ammonia produces a brownish voluminous precipitate of ferric hydroxide.

An alcoholic solution of ferric chloride is used in medicine as tincture of iron. The solution is a powerful astringent, and is used to stop severe bleeding.

Copper, Cu (Cuprum).—This metal is found in its native state and in a large number of ores, the principal ones being copper oxides (*ruby copper ore*), basic carbonate (*malachite*), and sulphide in *copper pyrites.*

It is a soft, ductile, and very malleable metal, of a peculiar red colour. It possesses a very good conductivity for electricity, and for this reason it is used largely in wire form for transmission of electric currents. Copper resists the action of air much better than iron, and only in presence of moist carbonic acid and other weak acids, as acetic acid (vinegar), *poisonous compounds* **(verdigris)** are formed. To prevent the formation of these compounds copper vessels used for cooking are generally *tinned.*

With other metals copper forms alloys, which are generally harder, tougher, and more durable than the metals themselves. Alloys of copper and zinc are *brass* and *muntz metal;* copper, zinc, and nickel form *German silver; bronze,* and the metal forming our *bronze coinage* (pennies, &c.), contain copper, tin, and zinc.

Copper also forms two series of salts, *cuprous* and *cupric salts.*

Cuprous oxide, *red oxide of copper,* Cu_2O, is obtained when copper is heated in air. Copper, like steel, when heated, assumes various colours, and finally becomes oxidised. It is obtained as a red precipitate when a solution of copper sulphate and caustic soda is heated with a solution of fruit sugar or dextrose (*Fehling's sugar test*). (*Experiment 76.*)

Cupric oxide, CuO, is also formed when copper is strongly heated.

Copper sulphate, cupric sulphate, *blue vitriol,* $CuSO_4.5H_2O$, is formed when copper or the oxides are dissolved in sulphuric acid. The blue crystals heated loose the water of crystalisation (repeat *Experiment 31*). When adding ammonia to a solution of copper sulphate at first a bluish-grey precipitate forms, which dissolves when an excess of ammonia is added, with a beautiful dark-blue colcur (*Experiment 77*). This solution is one of the few reagents which dissolves cellulose (cotton wool).

In agriculture, sulphate of copper is used in solution as a *pickle* for wheat, in order to kill the spores of **smut.** It is also the active ingredient of *Bordeaux*

mixture, used as spray for fruit trees and grape vines. Blue vitriol is occasionally adulterated with iron sulphate, which has a much lesser action on spores than the former.

All copper salts are poisonous.

Lead, Pb (plumbum).—The principle ore is the sulphite: *Galena*, PbS.

Lead is a very soft metal, which melts at a fairly low temperature. At the air it oxidises easily and is always covered with a film of oxide. By the action of moist air and carbonic acid a basic carbonate **white lead** is formed. Leaden vessels are extensively used in manufacturing chemistry, as they are not attacked at ordinary temperature by either concentrated sulphuric, nitric, hydrochloric, or hydrofluoric acids. Lead is used for manufacture of shot, sheet lead used for covering of roofs, water and gas pipes, and type metal, for which latter puproses the lead is hardened by addition of the metal antimony. **Solder** is an alloy of tin and lead.

All lead salts are poisonous, and even traces of lead salts are very dangerous in foods, as these compounds accumulate in the system.

Mercury, Hg (Hydrargyrum).—The well-known bright, silver-white liquid metal is found pure in form of small globules in some of its ores and also combined with silver and gold as amalgam. The principal ore is the sulphide, HgS, *cinnabar*. Mercury or quicksilver is used in the manufacture of thermometers and barometers, looking-glasses, and in medicine. All its salts are *exceedingly poisonous.*

Mercuric chloride, $HgCl_2$, *corrosive sublimate*, is one of the most powerful disinfectants, and a solution of 1 part in 10,000 parts of water kills most micro-organisms. Three grains have been known to cause the death of a child.

Mercurous chloride, Hg_2Cl_2, *calomel*, is a white powder, insoluble in water, which is frequently used in medicine.

Silver, Ag (Argentum), is found uncombined as native silver and combined in many ores. It is a lustrous white metal, extremely malleable and ductile. It does not oxidise exposed to the air, and is only slightly tarnished and blackened by traces of sulphuretted hydrogen, H_2S. Alloys of silver and copper are used for coinage, silver utensils, and jewellery.

Silver is easily soluble in nitric acid, forming a solution of **silver nitrate**, $AgNO_3$ (*lunar caustic*). In the presence of organic matter and exposed to the light this salt decomposes, forming a black deposit. Skin will be stained black by the solution. It is used in photographic and for preparation of marking inks. It is poisonous.

Gold, Au (Aurum), is nearly always found in its metallic state. Gold is the most malleable and ductile of all metallic elements; it is only soluble in mixture of hydrochloric and nitric acid (aqua regia). Gold is also dissolved by the action of chlorine gas and by dilute solutions of potassium cyanide, and both methods are made use of in the extraction of gold found in very finely divided condition and in small quantities in ores.

As pure gold is an extremely soft metal, it is used for coinage and jewellery alloyed with silver and copper.

Zinc, Zn.—The principal ores are the sulphide, *zinc blende*, the carbonate, *zinc spar*, and the oxide, *red zinc ore*. Zinc is a bluish-white metal; it is very brittle, but when heated becomes malleable. It is much lighter than lead, and is used for the manufacture of water pipes, roofing material, by itself, and again in the form of a thin film as a coating for iron by dipping the iron in a bath of molten zinc (*galvanised iron*). This film is much more adherent if the iron was first covered with a thin coating of tin by galvanic action.

Zinc oxide, ZnO, *zinc white*, is often used as a paint in place of the more poisonous white lead.

Zinc sulphate, $ZnSO_4.7H_2O$, *white vitriol*, is obtained when zinc is dissolved in sulphuric acid. It forms colourless prismatic crystals, very soluble in water. The solution has an astringent taste, and is, like all zinc salts, poisonous.

Tin, Sn (Stannum).—This metal is remarkable for its lustre and whiteness; it fuses easily, and oxidises when heated. It is harder than lead but softer than zinc. It is very malleable, and can be rolled into thin sheets—*tinfoil*. It is not affected by air or water at ordinary temperatures, and is for this reason largely used for tinning of copper and iron vessels. Tin is used in many useful alloys, as Britannia metal, pewter, gun metal, &c. Tin salts are also poisonous.

APPENDIX TO NINTH LESSON.

Experiment 70.—Heat a mixture of powdered iron ore (hæmatite) with soda on a piece of charcoal in the reducing flame of the blow pipe.

Experiment 71.—Prepare a solution of green vitriol by dissolving iron filings in dilute sulphuric acid, or by dissolving some clean crystals of green vitriol in water, and add a solution of caustic soda.

Experiment 72.—Repeat the experiment by adding milk of lime instead of caustic soda.

Experiment 73.—Prepare watery extracts of wattle bark, mangrove bark, oak galls; and show the colouration produced on addition of a few drops of iron sulphate solution.

Experiment 74.—Heat crystals of sulphate of iron to red heat in a blowpipe flame.

Experiment 75.—Dissolve the red oxide formed in hydrochloric acid and show precipitate of $Fe_2(OH)_6$ formed on addition of ammonia.

Experiment 76.—Prepare an alkaline solution of copper sulphate by adding caustic soda to a concentrated solution of blue vitriol, containing some tartaric acid, until a dark-blue solution is formed. On boiling this solution with a small quantity of glucose, grape sugar, and honey, the blue colour will disappear, and a red precipitate will be formed. Show that cane-sugar solution will cause no precipitation. To prepare proper Fehling solution, dissolve 34·6 grammes copper sulphate in 500 cc. water; and 76·5 grammes of caustic soda and 175 grammes of tartarated soda (Rochelle salt) in another 500 cc. of water. Mix equal quantities of the two solutions shortly before being used for the sugar test.

Experiment 77.—Add concentrated ammonia gradually to a solution of blue vitriol; show that precipitate at first formed redissolves on adding excess of ammonia. A little bunch of cotton wool left in this solution will be dissolved after standing a while, and a white precipitate of cellulose will be obtained by adding an acid to the solution.

QUESTIONS TO EIGHTH LESSON.

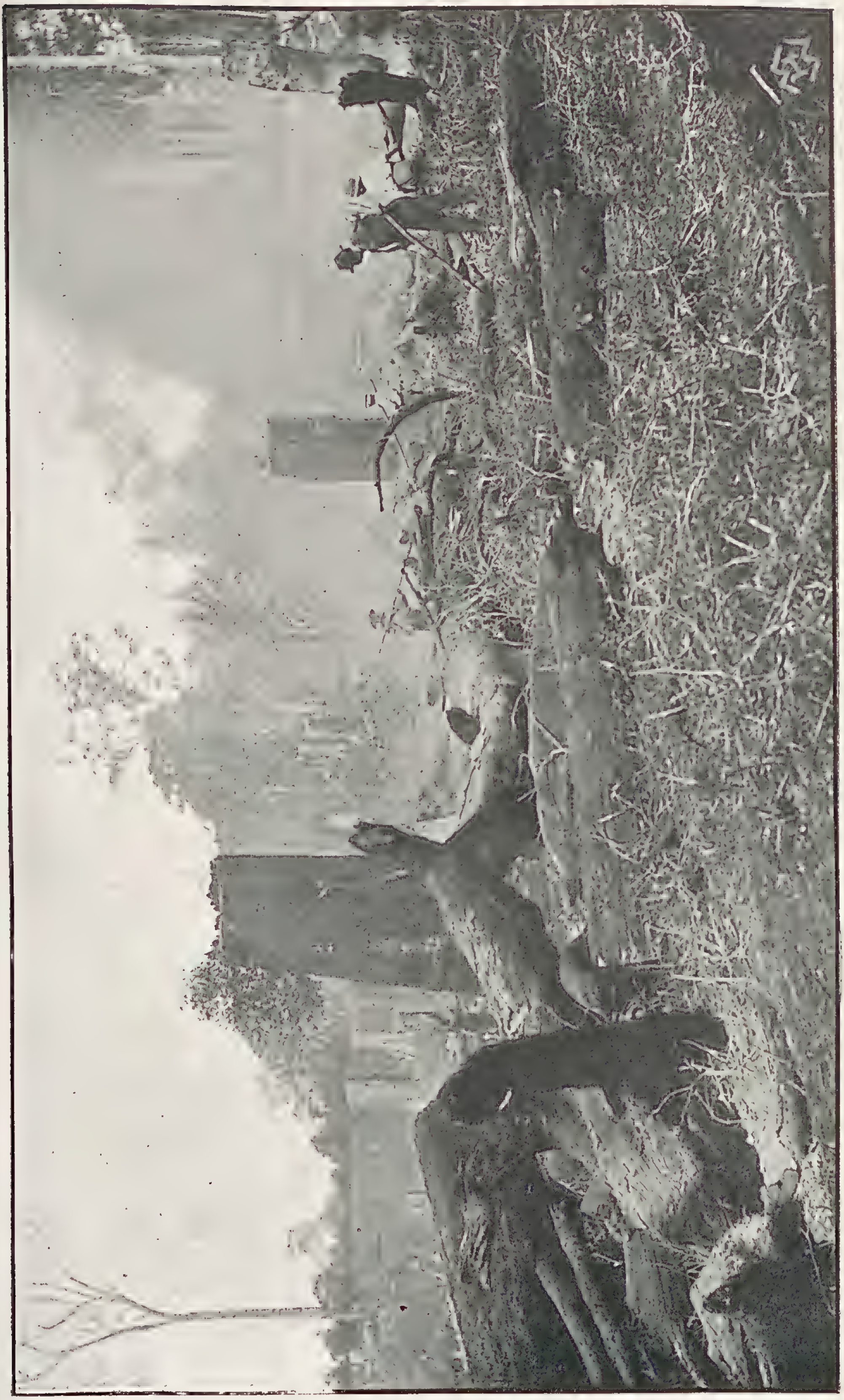
1. What colour of soils is generally caused by presence of iron?
2. What impurities are generally found in cast iron?
3. What is the difference in composition and properties of cast iron, wrought iron, and steel?
4. Why is Thomas phosphate a by-product in the manufacture of steel?
5. How can you destroy the injurious properties of certain iron salts in soils?
6. What is the difference between ferrous and ferric salts?
7. What is the difference between green, blue, and white vitriol?
8. Can green vitriol replace copper sulphates in a pickle against smut in wheat?
9. Why must every soil contain iron salts?
10. What are alloys?
11. What metals are chiefly used in alloys?
12. What is the difference between iron, zinc, tin, and silver with regard to their behaviour when exposed to moist air and action of carbonic acid?
13. Which metallic salt is one of the most powerful disinfectants?
14. Why is zinc white now frequently substituted for white lead for the painting of rooms?
15. What is Fehling's sugar test?

"*THE FERTILISERS ACT OF* 1905."

ANALYSES OF MANURES (FEBRUARY, 1906).

Manufacturer.	—	Manures.	No. of Analysis.	Moisture.	Nitrogen.	Equivalent to Ammonia.	Phosphoric Acid.	Equivalent to Tricalcic Phosphate.	Degree of Fineness. Percentage of— Fine.	Medium.	Coarse.
Queensland Meat Export and Agency, Ltd.	Brisbane ...	Bonemeal	540	6·76	3·55	4·31	25·65	56·0	40·8	36·4	22·8
Ditto ditto	ditto ...	Fertiliser without blood	541	11·39	5·53	6·72	14·33	31·3	24·0	25·6	50·4
Ditto ditto	ditto ...	Fertiliser with blood ...	542	10·41	6·38	7·75	10·93	23·9	40·4	30·4	29·2
Ditto ditto	ditto ...	Dried blood	543	7·67	12·96	15·74	1·80	3·9	23·2	...	76·8
Baynes Bros.	ditto ...	Fertiliser	567	17·26	4·49	5·45	14·40	31·4	50·9	25·9	23·2
Queensland Fertiliser Company, Ltd. ...	Runcorn ...	Bonemeal	563	10·79	4·07	4·91	24·20	52·8	10·0	10·0	80·0
							Equivalent to Sulphate of Ammonia.	Sand.			
Brisbane Gas Company, Ltd.	Brisbane ...	Sulphate of ammonia...	591	2·67	20·59	25·00	96·46	·21			
South Brisbane Gas and Light Company, Ltd.	South Brisbane	ditto ditto ...	593	1·79	20·63	25·05	97·26	·04			

Plate XXV.



Burning-off for Fruit-growing, Blackall Range.

Forestry.

THE BLACK WATTLE *(ACACIA DECURRENS)* IN HAWAII AND NATAL.

Thirteen years ago (writes Mr. L. A. Thurston, Chairman, Committee on Forestry, in the "Hawaiian Forester") a lot of 6 acres was planted in the Tantalus Forest with this tree. The location was a rocky one, with poor and shallow soil. As the trees were not in a healthy condition, Mr. Jared Smith, the superintendent of the Experiment Station, caused them to be cut down last spring, the bark removed and sold for tanning material, and the wood sold. Careful statistics were kept by him of the results obtained from this small area. By his kindness I am able to present such results to this association, which are as follow:—

The 6 acres yielded 500 first-class fence posts, which were used as samples and given to tanneries.

Thirty-six tons were sold at 23·31 dollars per ton, realising a total amount of 839·44 dollars.

The 6 acres yielded 500 first-class fence posts, which were used upon the station. These posts, if purchased, would have cost 25 cents a piece, making the value received from posts 125 dollars.

In addition to the fence posts there was realised 88 cords of firewood, which was sold at an average of 7·83 dollars per cord, producing a total of 689·25 dollars.

Allowing the same price for the 2 tons of bark given away, there would be an additional value of 46·62 dollars.

A summary of the amount produced by these 6 acres of black wattle is then as follows:—

	$
36 tons of bark sold	839·44
2 tons of bark given away	46·62
500 posts	125·00
88 cords of wood	689·25
Making a total of	$1,700·31

or equivalent to 283·38 dollars per acre.

This represents in British currency a total of £354 3s. 4d., or equivalent to about £59 per acre. Mr. Thurston considers that a plantation of black wattle can be worked at an expense represented by the value of the firewood, leaving the bark a net profit. We have frequently advocated the planting of wattle-trees on land otherwise useless in Queensland, but up to the present the lantana and prickly pear have held possession.

Concerning the wattle industry of Natal, Jared G. Smith, Hawaii Experiment Station, says:—

The black wattle industry of Natal, although only twenty years old, has become one of the most important in South Africa, and exports of bark during 1904 were valued at £70,000. There are at present over 30,000 acres planted. T. R. Sim, Conservator of Forests in Natal, states that there is no other forest tree capable of extensive cultivation, which yields a return in so short a time. Complete felling may take place at any period after five years of age, although ten years is nearer the average age at which the trees are cut. The average yield amounts to 5 tons per acre of dry bark and 30 cords of dried timber. The bark when dry is chopped, shredded, or ground, and bagged in 3-bushel sacks, weighing, when full, about 184 lb. At Dalton, which is one of the

principal centres of wattle production, the price paid for dried bundled bark ranges from £6 to £6 8s. per ton, and for bark that had been ground and bagged £7 to £7 16s. It costs 6s. 3d. per ton freight from the interior to Durban, the shipping port, and £1 per ton from there to Europe. The wood is sold for fuel at from 5s. 2d. to £1 per cord, while heavy mine timbers bring about double that price. Mr. Sim states that "the first requirement in wattle culture is an ability to grasp local conditions, and adapt every detail of the work to meet them, the amount of variation in products as well as in results being extraordinary."

QUEENSLAND TIMBERS USEFUL FOR BOAT-BUILDING AND CABINET-WORK.

Mr. W. Macartney, of Forest Hill, Mackay, who is an enthusiastic botanist, and has almost a life-long experience in the timber trees of Australia, has forwarded to Mr. F. M. Bailey, Colonial Botanist, a very interesting account of some of the timber trees of North Queensland. He gives the results of a ten years' trial of some of them built into a whaleboat which was constantly in the water except at intervals for repairs and painting. This experience is most valuable, as many people hesitate to use our splendid native timbers owing to a prejudice which is costing the State a great deal, and which is the cause of the shameful waste going on in the way of clearing, burning, and ringbarking. The timbers used in various portions of the whaleboat are given below, together with Mr. Macartney's remarks as to their durability below and above water:—

Endiandra.—A grey-coloured wood, close-grained, hard and tough; habitat, tropical scrubs. For deck timber, fairly durable.

Premna.—A brown wood of excellent quality.

Terminalia.—Wood of a light colour, close-grained, and hard; excellent for a boat's upper works; stands the sun without shrinking or warping.

Trema.—Wood of a whitish colour, one variety red; both soft and light. Planks of this wood last long below water; above water, fairly lasting, but the wood warps.

Aglaia.—Excellent for boats' ribs.

Acacia cincinnata.—A splendid timber for boats' ribs; bends perfectly; remains sound, and resists the attack of the teredo (cobbra).

Polyalthia.—Wood dark-grey, close-grained, nicely marked, with a strong spice-like fragrance; becomes rotten when used as boats' ribs and knees.

Flindersia B.—A good timber for a boat's keel or sternpost, but cracks above water.

Melaleuca L.—Paper-barked tree; useful for knees and fair for planks.

Cedrela Toona.—Wood beautifully grained, red; easy to work; brittle and soft when old.

Albizzia.—Useless. Cannot be bent for boat work.

Sarcocephalus C.—The same remark applies.

Alphitonia excelsa.—A capital timber for masts, booms, gaffs, also for oars; very good for planks.

Sideroxylon.—Bends well for ribs, but rots quickly. Made into oars and spars, it warps, cracks, and is too heavy.

Hibiscus (large Maritime).—Cannot be excelled for boats' knees and flooring planks.

Casuarina.—Makes fair knees; very hard.

Eugenia.—Excellent under bilge water. Knees have not rotted in ten years.

Avicennia off.—The wood is strong, tough, hard, and durable; useful for all purposes; will not split.

Science.

THE SUBTERRANEAN RIVERS OF QUEENSLAND.

At a meeting of the Toowoomba Chamber of Commerce in January last, Mr. E. Beddington read a most interesting paper on the subject of underground water in Queensland. His object, he said, was to prove from his long experience that Queensland possesses a magnificent system of subterranean streams and rivers which are known only to a few. There rivers, he said, never cause floods, never wash away fences, or bring down noxious weeds. Our sheep and cattle never bog in them, and there is no waste land, while the surface of these streams often carries heavy crops of produce. Mr. Beddington showed that nearly all the valleys running down the Main Range have several good streams running down them, some 300 feet wide, and these can usually be tapped at between 30 and 60 feet, often as deep as 278 feet; but at whatever depth they are found the same river bed silt is found in all of them. Our space will not allow us to print this most interesting paper, which goes to show that large streams of water run at inconsiderable depths in almost every district in Queensland. For instance, at South Toolburra the real Condamine has been found to run under the property with a width of a mile. In every paddock streams were tapped at from 20 feet to 50 feet from the surface. In the high country the water was tapped at 100 feet, and has never been reduced. At Talgai West streams have been tapped at 60 feet, 90 feet, and 115 feet, when the water rose to within 20 feet of the surface. At Ramsay and Greenmount all the bores have shown the same results. At Eton Vale the late Mr. Hodgson engaged the services of a geologist to try for water on a dry part of the estate. The latter suggested sinking a well. This was carried to a depth of 200 feet, and only a very small supply was obtained. Some years afterwards Mr. Beddington found a nice stream 20 feet wide running under the valley. A well 15 feet deep was sunk, and water was struck. At 20 feet the rush of water was so great that the well could not be deepened. Similar results have been obtained at Wellcamp, Gowrie, Goombungie, also on the Cressbrook Estate, where wells were sunk in which at 26 feet running streams were tapped, the water rising 16 feet in the bore, furnishing a supply of 2,000 gallons per hour. An Oondooroo water was struck at 90 feet. At Yandilla a pulsometer pump raises 22,000 gallons per hour day and night from a well 54 feet deep, and this during the great drought.

We can add to this that, in 1863, the West Oxley (Sherwood) farmers went 2 miles for water. Messrs. W. Gray and A. J. Boyd, who were farming there at the time, sank wells—one in Donaldson's paddock, 6 feet deep, when a heavy mineral spring was struck; the other, in Mr. Boyd's paddock, only 100 yards distant, was sunk to 10 feet, when a splendid supply of sweet water was struck. Neither of these wells has run dry since they were sunk.

There is no doubt that hundreds of rivers are running underneath the surface of Queensland, and these can unfailingly be detected by the water diviner. None of the wells here mentioned are artesian. Subterranean waters or rivers so-called are derived from a totally different source, probably from the soakage in the high and low lands in wet seasons. At the Sandhills, Bundaberg, there is, or was, a shallow well on the sea beach which supplied all the stock in the neighbourhood during the great drought. With these facts before us, it would seem that only apathy and incredulity on the part of settlers in so-called arid districts can account for the cry for water—"Water, water everywhere, and not a drop to drink."

The London Butter Market.

Mr. Charles Hammar, of the Moreton Butter Factory, Brisbane, supplies the following remarks on butter export problems to the "Brisbane Courier" of 22nd ultimo, which will doubtless prove of interest to many of our readers who do not regularly receive metropolitan journals:—

The dairying industry is rapidly assuming increased importance to the community, and should receive every consideration in all directions conducive to its establishment on a solid and sound basis.

The export market on consignments of Queensland butter has for some time been of a highly hazardous nature, and now indicates an extremely unsatisfactory condition.

The time of the year has now arrived when what is known as the Australian-London butter season has practically ended, and from now the position will appear more acute every day, judging by cable intelligence received.

Financially, the exports of butter this season will prove unremunerative to those shippers who pursued the policy of refusing extraordinary good prices for the butter, and chose to send on consignment.

The manufacturers have from time to time fixed the current prices for cream and butter at a shade higher rates than export values, according to cable advices from London, and paid the cream suppliers on that basis.

In order to form an approximate idea of the relative difference between the local export values compared with sending on consignment, the following schedule, compiled from official data, will demonstrate my contention:—

	Boxes.	*Local Export Values (Estimated).	*Cable Realisation (Estimated), Less Charges.
		£	£
Orontes	5,383	13,345	13,053
Oruba	3,785	9,135	8,567
Orotava	7,345	18,209	16,342
Ormuz	10,289	26,405	21,864
Oroya	13,323	34,584	26,979
Ortona	15,111	35,259	29,073
Ophir	10,873	24,106	20,930
Orient	14,409	31,939	27,737
Orontes	8,046	16,427	15,488
Oruba	12,000	24,150	23,100
	100,564	£233,563	£203,137

The above discrepancy of £30,426 7s. 1d., or about 15 per cent. of the total exports, represents the loss sustained by the shippers for the period in question—namely, from 24th November to 31st March, inclusive. Shipments from here since February have been calculated at to-day's London values, which is equal to 8¼d. per lb. here, and the recent cable advices indicate no prospects of a recovery in prices that will affect the butter afloat.

In this schedule no account has been taken in respect to second and third grades of butter, which comprise from 20 to 60 per cent. in some shipments, and it is safe to calculate on a correspondingly further loss in proportion.

These losses if affecting the proprietary factories will be a serious matter, but, of course, will be borne by them, and will make no material difference to

* Shillings and pence omitted.

the cream suppliers, whereas the co-operative factories have to provide for it, either by calling up additional capital or paying less than the value until the liability in the shape of reclamations has been provided for. Such state of affairs will have a retarding effect on the progress of the industry.

The object of this communication is to draw attention to the serious risk of speculating on the London market, especially when the prices offered are on a comparatively high level.

The advances on consignments for this season's shipments, it may be assumed, have been in line with the anticipated export realisations at the time of despatch, and it, therefore, follows that instead of making a small profit on straight out sales the shippers will in due course be called upon to face heavy reclamations, or accept by possible arrangements less than the full value of subsequent shipments until the deficiency is covered.

It would, in the writer's opinion, be in the best interests of all concerned if the butter for export was sold here by auction like wool, tallow, hides, skins, &c., or by private contract to the highest bidder, and thus abolish the speculative risky element of the business.

This course is followed by Denmark, Sweden, New Zealand, and recently to a great extent by Victoria.

The average value of butter in London, comparing Queensland with Victoria during the past season, has been only about 2s. per cwt. less for the Queensland article, thus showing that the quality is nearly equal, but as a remarkable fact the f.o.b. sales in Melbourne for export to London during the past six weeks have been at a rate of from 10s. to 15s. per cwt. higher than those obtainable in Brisbane.

This seems to demonstrate that Queensland butter on consignment is being sacrificed in London at considerably less than its relative value.

Would the butter be sold at so low a figure at present if it was held by purchasers in London?

It may be safely assumed that fully 80 per cent. of the Queensland exports of butter under the period in question has been consigned to London.

PRICE OF SISAL AND OTHER FIBRES.

From the "Journal d'Agriculture Tropicale" for January, 1906, we learn that the price of all fibres is on the up grade, partly in consequence of the probability of a reduction in the exports of Russian hemp, owing to the revolution in that country. A nice sample of sisal was received from Mexico, but the price demanded for it was disproportionate to latest quotations, which were at date £39 13s. 4d. per ton. Prices for Manila, New Zealand, and Mauritius hemp have advanced, and are, as quoted in the report on prices in British markets, on another page of this Journal.

It is satisfactory to know that the first sale of sisal hemp prepared at the Penal Establishment at St. Helena, amounting to 10 cwt., has been sold to Messrs. Miller and Co., rope manufacturers in Melbourne, at £35 per ton, f.o.b., Brisbane. Had there been a large quantity and continuous supplies available, a higher price would have been obtained. The sisal was planted at St. Helena for nor other purpose than creating a breakwind on the weather side of the island. For this the plants were set very closely together, and soon grew into an impenetrable hedge. There was naturally no possibility of any cultivation. The total area planted covered less than an acre. Already about 15 cwt. of marketable hemp has been sent away, and fully one-third of the leaves have yet to be cut. We estimated that the plot would yield at a first cutting from 15 cwt. to 20 cwt. of saleable fibre, and it would appear that this estimate is likely to be considerably exceeded. Besides the straight fibre, there is a considerable quantity of tow, valued by ropemakers in this and the southern States at £20 per ton.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

Stations.	1905.											1906.	
	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
North.													
Bowen	0·50	1·17	5·72	0·74	0·53	0·39	0·06	4·03	0·05	3·91	0·04	12·84	8·73
Cairns	8·59	6·81	6·92	3·89	1·94	0·43	2·27	Nil	0·46	1·72	0·53	6·99	16·87
Geraldton	5·71	8·26	20·51	13·35	9·39	2·41	3·88	Nil	0·22	5·44	1·14	15·61	37·67
Herberton	3·37	0·75	2·41	2·67	1·17	0·05	0·89	Nil	0·21	1·69	0·51	15·20	3·73
Hughenden	0·07	0·70	3·84	Nil	0·41	0·47	Nil	Nil	0·13	0·07	0·14	6·11	3·93
Kamerunga	7·56	4·38	8·89	5·63	2·59	1·11	2·16	Nil	0·63	1·05	0·33	7·25	13·76
Longreach	0·53	0·17	2·41	Nil	Nil	0·22	Nil	Nil	0·06	0·77	0·17	3·99	8·61
Lucinda	1·68	2·79	23·06	3·15	1·92	4·14	0·89	0·15	0·68	2·03	0·95	10·13	49·97
Mackay	4·73	3·67	13·19	2·17	1·82	0·95	0·66	0·97	0·08	2·45	0·70	13·58	9·88
Rockhampton	0·92	0·09	8·93	0·95	0·54	0·26	0·51	0·70	0·91	1·05	4·77	4·24	15·31
Townsville	1·97	2·02	6·41	0·52	0·35	0·68	0·06	...	0·52	0·19	Nil	7·30	15·68
South.													
Barcaldine	0·12	0·25	1·56	Nil	Nil	0·30	0·04	Nil	0·15	1·49	1·30	4·00	7·07
Beenleigh	3·04	2·91	3·63	2·21	0·40	0·27	1·12	1·15	2·82	1·76	3·77	4·96	12·84
Biggenden	1·94	3·61	3·81	1·46	0·60	0·28	0·10	0·79	2·56	1·14	11·66	2·27	8·24
Blackall	0·23	2·34	5·02	0·21	Nil	0·68	0·04	Nil	0·29	1·45	0·83	5·13	11·14
Brisbane	2·64	2·65	4·50	1·10	0·39	0·28	0·65	1·32	2·22	3·63	8·21	4·16	12·71
Bundaberg	2·17	3·35	6·31	4·26	1·10	0·71	0·17	0·95	2·37	0·95	6·74	6·92	9·92
Caboolture	3·43	3·57	4·89	1·65	0·26	0·05	0·36	0·98	2·73	2·88	6·72	8·11	12·73
Charleville	0·73	1·67	3·87	0·63	0·01	0·15	0·14	0·09	0·99	0·68	0·12	1·29	10·66
Dalby	0·74	5·46	3·09	2·19	0·25	1·15	0·76	0·14	2·09	1·60	5·67	4·15	4·37
Emerald	0·25	1·76	6·00	0·72	0·06	0·50	0·30	0·29	0·64	4·41	0·80	6·12	7·81
Esk	0·85	1·87	3·52	1·68	0·33	0·52	0·57	0·65	3·21	3·65	5·98	5·49	6·79
Gatton College ...	1·10	1·71	4·22	2·56	0·26	0·98	0·27	0·54	2·59	3·59	4·73	3·75	5·33
Gayndah	0·82	1·58	4·06	1·07	0·42	0·54	0·25	0·30	2·38	1·52	5·58	2·81	9·65
Gindie	0·06	1·74	7·44	0·41	0·11	0·37	0·09	Nil	1·11	3·79	Nil	1·92	9·15
Goondiwindi	0·87	2·53	6·49	1·23	0·55	0·52	0·58	Nil	3·57	1·51	2·72	1·08	2·60
Gympie	2·29	2·00	7·05	4·49	0·79	0·78	0·70	1·85	1·48	1·44	5·03	6·06	7·38
Ipswich	1·30	1·85	2·86	1·98	0·50	0·44	0·78	0·70	2·91	3·32	3·64	5·30	7·22
Laidley	2·33	2·17	4·11	2·59	0·56	0·56	0·61	0·30	2·36	3·59	3·73	3·29	5·63
Maryborough	2·67	2·78	3·48	3·56	1·21	0·07	0·26	1·04	2·48	0·70	4·03	4·46	8·34
Nambour	5·38	3·58	6·65	4·79	1·36	0·05	0·83	1·62	4·70	0·85	5·37	7·01	16·50
Nerang	4·99	5·61	8·98	3·63	0·61	0·27	1·55	1·04	4·59	2·21	5·14	5·01	13·68
Roma	1·74	1·44	2·92	1·72	0·21	0·35	0·31	0·15	1·02	2·15	2·62	2·18	12·95
Stanthorpe	0·37	5·29	2·64	1·63	1·01	0·63	1·77	0·28	3·48	1·94	4·43	6·06	2·76
Tambo	1·34	2·54	5·12	0·12	0·06	0·36	0·46	Nil	0·85	1·57	0·39	5·09	9·05
Taroom	1·63	2·73	6·17	2·22	0·33	0·67	0·31	Nil	0·76	1·11	2·52	1·86	13·73
Tewantin	2·91	3·64	12·43	10·01	2·06	0·22	0·55	1·29	6·57	1·28	6·61	12·07	18·59
Texas	0·09	2·47	3·78	3·07	0·80	0·53	1·09	0·16	3·54	0·94	4·54	3·41	2·11
Toowoomba	1·91	4·17	5·27	3·69	0·65	1·01	0·66	0·61	2·59	2·09	3·20	6·17	6·58
Warwick	1·28	6·20	2·06	2·18	0·77	0·26	1·01	0·41	4·00	2·16	3·98	2·09	2·21
Westbrook	0·57	2·00	1·24	2·54	0·46	0·71	0·61	1·23	2·60	3·62	2·39	5·00	4·01

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Choicest Australian (unsalted), 102s. to 108s.; New Zealand (unsalted), 105s. to 108s.; Siberian, 102s. to 104s. Late advices point to very much lower prices next month.

CHEESE.—Canadian, 62s. to 65s.; New Zealand, 63s. to 64s. per cwt.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £17 to £18; raw, £14 to £17 per ton; German beet, 88 per cent., 8s. 3d. per cwt.

MOLASSES (duty, 1s. to 2s. per cwt.; for agricultural purposes only, duty free).—5s. to 9s. per cwt.

RICE.—Real Carolina, £26 to £28; Rangoon, £8 5s. to £12; Japan, £13 to £17; Java, £16 to £20; Patna, £10 to £17 per ton.

Coffee (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 50s. to 105s.; peaberry, 54s. to 100s.; Santos, 30s. to 53s.; Jamaica, 100s. to 130s. per cwt.

Chicory Root, Dried (duty paid).—24s. to 25s. per cwt.

Arrowroot.—St. Vincent, 1¾d. to 3½d.; Natal, 3d. to 4d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

Wheat.—Duluth, 33s. to 34s. per 496 lb.; English, 30s. to 34s. per 504 lb.; Australian, 33s. 9d. to 34s. 6d. per 496 lb.

Malting Barley.—29s. to 33s. per 448 lb.; grinding, 19s. 6d. to 29s. 6d. per 416 lb.

Oats.—New Zealand, 23s. 6d. to 25s. 6d. per 384 lb.

Split Peas.—42s. to 45s. per 504 lb.

Ginger.—Jamaica, 42s. to 65s.; Cochin, 34s. to 65s.; Japan, 24s. to 25s. per cwt.

Vanilla.—3s. 9d. to 7s. 6d., 7 to 7½ in.

Pepper.—Capsicums, 14s. to 60s.; chillies, 32s. to 37s. per cwt.; black, 5d. to 5½d.; white, 7½d. per lb.

Rubber.—3s. 10d. to 5s. 4d.; Ceylon "biscuits," 6s. 4d. per lb.

Green Fruit.—Apples: Australian, no quotation; Tasmanian, no quotation; American, 15s. to 22s.; Canadian, 20s. to 26s. per case; bananas, per bunch, 5s. 6d. to 10s.; pineapples, 3s. to 6s. each. Oranges, Valencia, per 420, common, 8s. 6d. to 9s. 6d.; medium, 11s. to 13s.; fine selected, 17s. to 21s.; finest selected, 24s. to 48s. Lemons, Messina, per 360, ordinary to fine, 12s. to 15s. per 360. Grapes, from 10s. for common to 26s. for choicest per barrel.

Dates.—Tafilat, 55s. to 65s.; Egyptian, 18s. to 20s. per cwt.; Persian, 10s. to 13s. per case.

Cotton.—Uplands, 6¼d.; Sea Island, 13d. to 15½d. per lb.

Cotton Seed.—£6 to £6 15s. per ton.

Cotton-seed Oil.—Crude, £18; refined, £21 per ton.

Cotton-seed Oil Cake.—£4 to £4 18s. per ton.

Cotton Waste.—In 5-cwt. bag bales, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

Linseed.—46s. per qr.

Linseed Oil.—£21 to £21 5s. per ton (per gallon).

Linseed Oil Cake.—£8 7s. 6d. to £8 10s. per ton.

Olive Oil.—£36 to £40 per tun (252 gallons).

Copra.—£17 10s. per ton.

Cocoanut Oil.—£34 per ton..

Beeswax.—Australian, £7 10s. to £8 per cwt.

Lucerne Seed.—60s. to 68s. per cwt.

Canary Seed.—62s. to 86s. per quarter of 480 lb. = 7s. 6d. to 10s. 9d. per bushel.

Honey.—17s. to 26s. 6d. per cwt.

Manila Hemp.—£42 per ton (Havre), for best.

Sisal Hemp.—£39 10s. per ton for best.

New Zealand Hemp.—£36 10s. per ton for best.

Fourcroya (Mauritius Hemp).—£35 per ton for best.

Sansivieria (Murva) Hemp.—Bright, £40; dark, £35.

Divi Divi.—£6 10s. per ton.

Tapioca (duty, 5d. per cwt.).—1½d. to 2½d. per lb.; pearl, 16s. to 20s. per cwt.

Eggs.—French, 9s. 6d. to 12s.; Danish, 8s. to 13s. per 120.

Bacon.—Irish, 60s. to 68s.; American, 46s. to 50s.; Canadian, 56s. to 60s. per cwt.

Hams.—Irish, 88s. to 108s.; American, 46s. to 60s. per cwt.

Pork (frozen).—5½d. per lb.

Tallow.—Mutton, fine, 32s.; medium, 27s. 6d.; beef, fine, 29s. 6d.; medium, 27s. per cwt.

Poultry (Smithfield).—Surrep, fowls, 3s. to 4s. 6d.; Lincolnshire fowls, 2s. 6d. to 3s. 3d.; Essex fowls, 2s. 6d. to 3s. 6d.; Irish fowls, 2s. to 2s. 6d.; feathered pigeons, 9d.; geese, 5s. 6d. to 7s.; ducks, 3s. 6d. to 4s. 6d.; turkey

cocks, 7s. to 15s.; hens, 6s. to 7s.; English hares, 2s. 9d. to 3s.; wild rabbits, 9d. to 11d. each; Australian rabbits, 13s. to 15s. 6d. per crate.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef, of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	Mar. 17.	Mar. 24.
New Zealand Sheep. (Crossbred Wethers and Merino Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$4\frac{3}{8}$d.	$4\frac{3}{8}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{3}{8}$d.	$4\frac{3}{8}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$4\frac{1}{2}$d.	$4\frac{1}{8}$d.
Southland (56 lb. to 64 lb.) ...	None offering.	
North Island (56 lb. to 65 lb.), ordinary	$4\frac{3}{16}$d.	$4\frac{3}{16}$d.
North Island, best brands (56 lb. to 65 lb.)	$4\frac{1}{4}$d.	$4\frac{1}{4}$d.
Australian Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$2\frac{7}{8}$d.	$2\frac{7}{8}$d.
Light (under 50 lb.)	$3\frac{3}{16}$d.	$3\frac{3}{16}$d.
River Plate Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{1}{4}$d.	$3\frac{3}{8}$d.
Light (under 50 lb.)	$3\frac{9}{16}$d.	$3\frac{9}{16}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	$5\frac{5}{16}$d.	$5\frac{3}{8}$d.
Canterbury, medium (36 lb. to 42 lb.)	$5\frac{5}{16}$d.	$5\frac{3}{8}$d.
Canterbury, heavy (42 lb. to 50 lb.)	$5\frac{1}{4}$d.	$5\frac{1}{4}$d.
Southland (28 lb. to 42 lb.) ...	None offering.	
North Island (28 lb. to 42 lb.) ...	5d.	$4\frac{7}{8}$d.
Australian Lambs.		
30 lb. to 40 lb. best brands (28 lb. to 42 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
30 lb. to 40 lb., fair quality (28 lb. to 42 lb.)	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
30 lb. to 40 lb., inferior quality (28 lb. to 42 lb.)	$3\frac{1}{2}$d.	$3\frac{1}{2}$d.
River Plate Lambs.		
28 lb. to 42 lb.	—	$3\frac{3}{4}$d.
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{3}{4}$d.	$2\frac{3}{4}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{1}{4}$d.	$3\frac{1}{4}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (180 lb. to 220 lb.) ...	$2\frac{7}{8}$d.	$2\frac{3}{4}$d.
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{3}{8}$d.	$2\frac{3}{8}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{3}{4}$d.	$2\frac{3}{4}$d.

QUEENSLAND TIMBER.—Selectors of standing scrub and forest lands should note that, in consequence of the action taken by the Director of Forests in Queensland, there is likely to be a considerable demand for various kinds of hardwoods and pine in the Southern States. Where its destruction can be avoided, such timber should be preserved. The demand for hardwood sleepers for export is increasing, and large quantities of sleepers are already required for the newly-commenced railway lines in Queensland and for replacing worn-out sleepers on existing lines.

General Notes.

COTTON-GINNING ESTABLISHMENT.

Referring to a notice in last month's issue of the Journal of the proposed establishment of a cotton ginnery in the Valley by Messrs. J. Kitchen and Sons, we are informed that the firm is now offering 1½d. per lb. for good, clean, average Upland seed cotton, delivered in wool bales at Brunswick-street Railway Station or free on wharf, Brisbane. Caravonica and Sea Island sorts will be valued according to quality. With the view of encouraging cotton-growing, they are prepared to supply small quantities of seed (up to 14 lb.) of Upland cotton seed free to applicants, putting the same free on board ship or on rail. Other varieties will be supplied at low rates.

ANGORA GOATS JUMPING FENCES.

It is generally understood that the Angora goat is not given to jumping fences when enclosed in a paddock. This is no doubt correct in the case of goats which have become accustomed to their surroundings, or which have been bred on the run. When, however, goats are imported, they should not be immediately given their liberty, or the chances are they will be very soon missing. A case in point lately happened at the Pine River. A gentleman imported a valuable buck Angora from the south and let it go, on arrival, in a paddock securely fenced with a 5-feet close paling fence. That night the goat jumped the fence, and has not since been heard of. To avoid such severe loss, it is well to tether new arrivals for a time until they have made themselves thoroughly at home.

WEST AFRICAN TIMBERS.

The Government of Southern Nigeria is evidently alive to the value of the forest timbers of that country, and also to the possibility of finding a market for them in Great Britain. In December last, Sir Alfred Jones, K.C.M.G., chairman of the African trade section of the Liverpool Chamber of Commerce, opened an exhibition (which is expected to be the first of a series of exhibitions) of samples of timber received from the Government of Southern Nigeria, in the old public saleroom, B9, Exchange Buildings. The exhibition consisted of twenty-one different samples of timber, and a typed description of the qualities and estimated commercial values was attached to each sample. The samples have been viewed by many people interested in the wood trade. Several samples of jute grown in West Africa have been added to the exhibition.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

GETTING RID OF COUCH GRASS.

A YOUNG FARMER, Roma.—Couch grass is usually got rid of by constant cultivation of crops and thoroughly working the land before planting. But try an old British farmer's plan. He sowed 3 bushels of tares to the acre. They entirely killed the couch. Another good way is to sow the land with roots in rows, to be able to cultivate it well as soon as the plant is out of the ground. Keep on cultivating by hand or horse hoe until the leaves cover the ground, when the couch will cease to grow and die out.

RUNNING A DAIRY FACTORY.

INQUISITIVE.—

Question.—How many hands should it take to run a butter factory turning out 6 tons per week, and what would be a fair salary and wages for same? The conditions are: That the factory is on the railway siding on the Downs; the butter is loaded straight into the truck, when required; no cartage whatever; and the most of the cream comes to the factory by carts from the farms; the buttermilk is taken away by a contractor who tenders for it; to make their own butter boxes.

Answer.—If the factory is equipped with refrigerating plant, and is up to date in other respects, the number of hands required would include one engine-driver, one butter-maker, and a boy to attend to details. Wages would amount to £4 5s. per week, viz.:—Engine-driver, £1 15s.; butter-maker, £2; and boy, 10s.

COAL ASHES AND GAS LIME.

HY. LANE, New Farm.—

Question 1.—Are coal ashes or flue dust good to mix with a clayey or stiffish soil? If so, which is best?

Answer.—Coal ashes and flue dust have very little manurial value, but would improve the texture of stiff soils. Coal ashes by themselves would be preferable, or they could be mixed with flue dust. Flue dust by itself would do no good.

Question 2.—Is gas lime of any value as a manure?

Answer.—Gas lime has the manurial value of ordinary slaked lime, and is of particular value for stiff clayey soils and also soils rich in organic matters.

Question 3.—What is the best mixture to use for a liquid manure to grow vegetables to perfection?

Answer.—(1.) Animal water from cowsheds contains principles which, during putrefaction, yield large quantities of ammonia. One pint mixed with 2 gallons of clean water makes a powerful manure.

(2.) Put a kerosene tin full of fresh cow or horse manure, the former for preference, in a bran bag. Suspend it in a barrel containing 30 gallons of water. Keep this stirred for a week, then let it settle. When clear, use 1 quart diluted wth 2 gallons of water.

(3.) Sulphate of ammonia—½ oz. to 1 oz. per gallon of water. This should not be used with lime, nor should it be applied to land recently limed. Or use a mixture of ½ oz. of ammonia sulphate, ½ oz. of potassium sulphate, and ½ oz. of superphosphate dissolved in 1 gallon of water.

(4.) Fowl manure dissolved at the rate of ½ lb. per 4 gallons of water will make an excellent liquid manure.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	MARCH. Prices.
Apples, Eating, per packer	6s. to 9s.
Apples, American, per packer	...
Apples, Cooking, per packer	6s. to 7s. 6d.
Apples, Local, per packer	4s. to 6s.
Apricots, quarter-case	...
Bananas, per bunch	6d. to 1s. 3d.
Bananas, per dozen	2d. to 2½d.
Grapes, per lb.	1d. to 4½d.
Cherries, quarter-case	...
Comquats, case	...
Lemons, per case, local	2s. 6d. to 5s.
Mangoes, half-case	4s. to 7s.
Oranges, Imported, per packer	9s. to 10s.
Oranges, Local, per packer	4s. 6d.
Passion Fruit, quarter-case	9d. to 1s. 6d.
Papaw Apples, per case	3s.
Peaches, quarter-case	3s. 6d. to 4s. 9d.
Peanuts, per lb.	3d.
Pears, Imported, per case	5s. to 9s. 3d.
Pineapples (rough leaf), per dozen	7d. to 2s.
Pineapples (smooth leaf), per dozen	9d. to 2s.
Plums, Imported, quarter-case	...
Plums, Local, quarter-case	...
Persimmons, quarter-case	1s. to 2s. 6d.
Quinces, per case	5s. 3d.
Strawberries, per quart	...
Tomatoes, quarter-case	1s. 6d. to 2s.
Watermelons, per dozen	...
Rockmelons, per dozen	...

SOUTHERN FRUIT MARKET.

Bananas, Queensland, per case	7s. to 8s. 6d.
,, ,, per bunch	1s. 6d. to 3s. 6d.
Lemons, per gin case	...
Oranges, per double case	...
,, Washington Navels, per double case	...
Pineapples, case	3s. to 6s.
,, per double case	...
Rockmelons, case	...
Peaches, half-case	...
Tomatoes, half-case	2s. 6d. to 3s.
Quinces, per case	2s. 6d. to 4s. 6d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH.

Article.		MARCH. Prices.
Bacon (Pineapple)	lb.	8d. to 9½d.
Barley, Malting	bush.	3s.
Bran	ton	£5
Butter, Factory	lb.	9½d. to 10d.
Chaff, Mixed	ton	£3 10s. to £3 12s. 6d.
Chaff, Oaten	,,	£4 2s. 6d. to £4 7s. 6d.
Chaff, Lucerne	,,	£3 to £3 10s.
Chaff, Wheaten	,,	£2 7s. 6d.
Cheese	lb.	5½d. to 6d.
Flour	ton	...
Hay, Oaten	,,	£5 5s. to £5 15s.
Hay, Lucerne	,,	£2 to £2 10s.
Honey	lb.	1¼d. to 2d.
Maize	bush.	2s. 6d. to 3s.
Oats	,,	2s. 9d. to 3s.
Pollard	ton	£5 2s. 6d. to £5 7s. 6d.
Potatoes	,,	£7 to £10 10s.
Potatoes, Sweet	,,	£1 5s.
Pumpkins	,,	£1 10s.
Wheat, Milling	bush.	3s. 9d.
Wheat, Chick	,,	2s. 9d. to 3s. 6d.
Onions	ton	£4 10s. to £5 10s.
Hams	lb.	9d. to 10d.
Eggs	doz.	8½d. to 1s. 4d.
Fowls	pair	1s. 9d. to 3s.
Geese	,,	4s. 3d. to 5s. 6d.
Ducks, English	,,	2s. to 3s. 3d.
Ducks, Muscovy	,,	2s. 5d. to 3s. 6d.
Turkeys, Hens	,,	4s. 4d. to 6s. 4½d.
Turkeys, Gobblers	,,	9s. 9d. to 10s. to 15s.

ENOGGERA SALES.

Animal.	FEBRUARY. Prices.
Bullocks	£9 17s. 6d. to £12 15s.
Cows	£6 15s. to £7 17s. 6d.
Merino Wethers	18s. 3d.
,, Ewes	16s. 9d.
C.B. Wethers	22s. 9d.
,, Ewes	18s. 6d.
Lambs	16s.
Pigs	...

Orchard Notes for May.

By ALBERT H. BENSON

The hints given in the notes for March and April on the gathering, handling, and marketing of citrus fruits apply equally to the present month, with this difference, however, that even more care is required, as the riper citrus fruits become, the more readily are they bruised and injured. May being usually a more or less dry month on the coast, the opportunity should be taken of cleaning up all weeds and rubbish that may have accumulated during the summer and autumn, and getting the surface of the land into a good state of cultivation, so that the comparatively small rainfall of the winter months may be conserved in the soil for the trees' growth. Unless this is done, fruit trees, especially citrus, are apt to suffer, especially if growing on shallow or badly drained soil with a retentive subsoil. Where not already done, all dead or worthless trees should be dug out; and if fresh trees are to be planted in the same place, then the holes from which the trees have been taken should be allowed to remain open, and the soil should be well exposed to the action of the atmosphere and be well sweetened. Land intended for planting during the winter should be got ready, more especially if it is new land, as it is a mistake to delay the preparation of the land too much, or to plant the trees in a raw, unsweetened, and improperly prepared land. What planting has to be done, see that it is done well, as an acre of land properly prepared will pay better than twice or three times that quantity treated anyhow.

Towards the end of the month, slowly soluble manures, such as boiling-down refuse or coarse bones, may be applied to the land, as they will become slowly available; and when the spring growth starts, the trees will get the benefit. Quickly soluble manure should not be applied now, but should only be used during a period of active plant growth, otherwise they are apt to be lost. Where possible, don't destroy the weeds and refuse of an orchard unless the same is diseased, or is likely to form a harbour for injurious insects, but rather form it into a compost heap, preferably with lime, and allow it to become well rotten, when it will be found to be a valuable manure for citrus and other trees in many soils; as, though our soils, as a rule, are great producers of weeds, many are actually deficient in vegetable matter, so that it is a mistake to burn off all weeds, grass, or other rubbish. This deficiency of organic matter in the soil is a serious consideration, as soils deficient in organic matter are usually deficient in nitrogen, and also they are deficient in the power to retain moisture—a matter of extreme importance in a country like this, where we are subject to such long spells of dry weather.

In the colder districts the pruning of deciduous trees may be commenced towards the end of the month, but in other parts of the State it is better to wait longer, as the leaves are not off and the sap is not down. Pineapples, where at all subject to frost, should receive a light covering of grass or other similar material as a protection, or, where practicable, as in the case of scrub lands, subject to light frosts, they should be covered with a light framework covered with palm leaves or similar material.

Palm stems or saplings resting on forked posts, placed on either side of the bed to be protected, make a good framework; and with palm-leaves, tea-tree bush, or other similar material laid across from sapling to sapling, a very cheap and efficient protection against frost is obtained.

Gather and destroy all infested guavas, oranges, custard apples, &c., so as to destroy the larvæ of any fruit flies or peach moths that may be in them, as if these insects are well killed down now there will be many less to deal with next spring, and there is a chance of the earlier fruits being harvested without much loss.

Farm and Garden Notes for May.

FIELD.—During this month the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now in this work. Potatoes should be hilled up. Cut tobacco. The last of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Growers are notified that cotton-ginning machinery has been installed by Messrs. Kitchen and Sons, in the Valley, Brisbane, so that a sure means of disposing of the crop is available (*see* Journal of 1st March, 1906). Every effort should be made to ensure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to the climate and to their particular district and soil. A few acres of artificial grass will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass in the West, as has been proved at Barcaldine, will carry ten or twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Hautbois, and Trollope's Victoria. The Aurie is the earliest, and the Marguerite next. In some localities, strawberry planting is finished in March, and the plants bear their first fruits in August. In others, fruit may be gathered in July, and the picking does not end until January.

KITCHEN GARDEN.—Onions which have been planted in seed beds may now be transplanted. The ground should have been thoroughly cleaned, pulverised, and rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather, plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus. Full instructions for the successful cultivation of this valuable vegetable will be found in the February issue of the Journal, 1906.

FLOWER GARDEN.—Transplanting and planting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, penstemons, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs, such as anemones, ranunculus, snowflakes, freesias, ixias, iris, narcissus, &c. Tulips and hyacinths may be tried, but success in this climate is very doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching and keep the walks free from weeds. Clip hedges and edgings.

Agriculture.

THE VALUE OF VEGETABLES.

We lately spent a couple of days on a large farm in the Logan district. The land is of excellent quality, besides which plenty of manure and abundance of water are available. One would naturally have thought that at least a few of the easiest-grown vegetables would be found here, but there was no sign of anything of the kind—not even the lowly pumpkin. At meal times the invariable fare was beef and bread, and the only luxury an excellent joint of Angora kid's flesh, boiled. The explanation was that the good people did not care for vegetables. Now, this distaste for vegetables indicates ignorance of their great dietetic value. Mrs. Nora B. Dunlop lately read a paper on this subject before the Illinois State Horticultural Society, a portion of which we strongly recommend to the serious study of all our non-herbivorous and carnivorous friends in the country:—

"Go," she said, "into the home of the average horticulturist or farmer, and you find that vegetables, their growth and use, in the dietary of that home is only a secondary matter. The garden is not planned and studied as the wheat, oats, barley, and potato crops, and is usually wholly inadequate in size, and with a very limited variety of vegetables in it.

"If our rural residents could realise the medicinal and dietetic value of many of our vegetables, we are sure they would learn to like them, and make greater use of them. If they could appreciate the money that would be saved, not only in providing a variety of food, but in doctors' bills, a little greater effort would be put forth on that most important side of every farmer's home.

"In the spring, if we have a good garden, we can be provided with all the medicine we need. Instead of taking patent medicine or doses from the doctor to act upon the liver and to purify the blood, let us go to our gardens for all needed help. Select from your garden spinach, kale, mustard, and asparagus, and they will prove better cleansers for your system than any drug. Spinach is called the broom of the stomach. If a broom, it must be to sweep and clean out the refuse of the stomach and intestines. Try it, and you will find it will be preferable to some bad-tasting medicine.

"Onions and lettuce and cabbage are needed in the spring to help purify the blood after the cold of winter. Lettuce and onions are also good for one troubled with insomnia. Cabbage and onions are said to be anti-scorbutic, but must be properly cooked to derive the full benefit of their use.

"As rheumatism is the result of dietetic errors, it can be cured by discarding foods causing the same, and substituting those corrective of it. One physician says he can cure rheumatism with cabbage. It can be alleviated by making onions, cabbage, and celery prominent in the diet of one so afflicted.

"We get the mineral elements from the vegetable kingdom that we need in the growth and repair of our bodies, and may it not be for a lack of these foods in proper proportion that we need so many dentists and orthopedists? There is always a cause to produce every effect. Study causes."

Amongst other vegetables, the Lima bean is of inestimable value. It thrives during the summer, and produces an amazing quantity of beans, which, being allowed to ripen, provide a delicious addition to the winter fare. The egg-fruit is one of our least known vegetables, yet the plant is easily grown, and yields large purple or yellow fruits, often attaining the size of an ostrich egg. Sliced and fried in the same manner as potatoes, they make a most tasty dish for breakfast. Take, again, Jerusalem artichokes, which are allied to the sunflowers. They are propagated in the same way as potatoes. They are very

hardy, will thrive in any soil and in any situation. The yield of tubers is enormous. We lately dug up one plant, and the tubers filled an ordinary tin washing-up dish. They are delicious when boiled, tasting something like asparagus. We could fill a book with a list of vegetables and their value as health-givers and health-restorers, and we strongly advise all farmers to pay more attention to the vegetable garden.

CUTTING SEED POTATOES.

A writer in "The Farmer and Horsebreeder" utterly condemns the time-honoured practice of cutting up the potato for planting purposes. He says:—

In all trials that have been recorded of the potato crops produced from cut and uncut seed, I have never met with an instance of the cut tubers yielding the most or best. This is a fact that must be very generally known, and it is somewhat surprising, I think, that it is not more acted on. It is extraordinary the disposition there is to cut up potatoes for planting. The process may increase the sets by about 30 per cent., but, if the time taken in cutting them and the decreased yield are taken into consideration, no advantage whatever is secured, but the reverse; and personally I would consider myself far better off in planting a piece of land with 25 cwt., or even 30 cwt., of whole tubers than 1 ton cut up to cover the same space. I believe cutting is generally done with the sole object of saving seed. There is no other reason I can imagine, and, as results show, it is a terribly poor one. In dealing with the cutting of potatoes the large tubers are mostly cut into three pieces, the medium ones into two, and the small ones are let go whole. The largest of the cut pieces may be as big as an ordinary-sized tuber, and seem to pass muster as a full-sized set, but plant this and a whole tuber of equal weight side by side, make a trial, and it will almost be invariably found that the whole tuber produces the greatest number of potatoes, and certainly the largest ones. The weight I have sometimes found as much as 2 lb. in favour of the whole set in one plant, and imagine what this implies in the case of thousands or tens of thousands of plants. The scarcer and more expensive a variety is the more it is cut, and, as a natural consequence, the worse the crop, and surely this is a degenerating process. I lament to say it has proved so in too many cases.

Potatoes have always had a fascination for me. I have studied them much over a period of a quarter of a century, and the further I go the more difficult I find it to solve one particular question or point. It is this: Why should early varieties of potatoes maintain all their qualifications seemingly interminably, while mid-season kinds, and particularly late sorts, dwindle and cease in a very few years or before ever they reach their teens? I can name you three early potatoes to-day which I was familiar with twenty-five years ago. They are Myatt's Prolific, Rivers' Royal, and Veitch's Early; and Sharpe's Victor is nearly as aged. To my certain knowledge the whole of them are as robust and prolific as ever. Further, I know of a grower who has adhered to his own sample of Myatt's for over twenty years. His stock is the best I know of, and he has a great demand for seed by those who know of the stability and purity of what he possesses. These are not speculative assertions, but absolute facts, and I have almost satisfied myself that this most desirable state in those early potatoes may be due in a very great measure to the non-cutting of the sets. None of them produce tubers of extreme size. The majority are suited for seed, and few ever cut them, but plant whole, and I think it probable that this may have preserved them all through those years. I feel sure my conclusions will be very generally confirmed by old and observant growers, and under the circumstances I feel sure that if cutting up potatoes for sets were wholly avoided, varieties would be much more durable, crops greater and better, and growers decidedly in pocket and better natured.

KOHL-RABI FOR SHEEP.

The kohl-rabi is a vegetable belonging to the same order as the turnip, but differing from the latter in that the enlargement at the base appears as a swelling of the footstalks of the leaves instead of the root. There are two varieties, the green and the purple, with large and small leaves. It was first brought into prominence in 1837, when the turnip crop was ruined by a grub which attacked it just below the surface of the ground. The texture of this part of the kohl-rabi is too tough to allow of its being injured by grubs, so that it made a good substitute for the turnip. The special advantages of this plant are—its immunity from insect attacks; the great extent to which it resists frosts; its habit of carrying all the edible portion well above ground, thus making it most valuable for feeding off by sheep without waste or the labour of hacking up the last portions of the bulbs; its remarkable power of standing drought; and its freedom from mildew. It will stand transplanting better than any of the root crops, which renders it valuable for filling up blanks. The time for drilling in the seed is August, September, and October, but sowings may also be made in February and March at the rate of 3 or 4 lb. of seed per acre. The cultivation is similar to that for the turnip. The distance for singling is from 12 to 16 inches, the globe-shaped varieties requiring more space than the oval. As a crop for ewes and lambs it cannot be surpassed, and sheep will do better on this than on any other root crop that can be given them. As a table vegetable, the kohl-rabi is much superior to the turnip.

MANURE FOR MANGELWURZELS.

Much attention has lately been given to the selection of the most profitable manure for mangels by the British Midland Agricultural and Dairy Institute. The main idea of the experiments has been to determine the use of manures on a profitable basis. The earlier trials demonstrated the advisability of using a complete artificial dressing containing nitrogen, phosphoric acid, and potash, which indicates that the omission of any of these was accountable for a considerable reduction in yield. It was shown in 1903 that the following dressings per acre gave the most profitable results:—

100 lb. sulphate of ammonia at seeding.

130 lb. nitrate of soda at seeding.

690 lb. superphosphate at seeding.

80 lb. sulphate of potash at seeding.

560 lb. common salt at seeding.

In what form these component elements could be most profitably applied has been the object of subsequent research, and the conclusions arrived at up to date are that in addition to farmyard manure the following dressing gives the most profitable crop of mangels:—

Sulphate of ammonia (at seeding), 100 lb. (or such an amount as contains 20 lb. nitrogen).

Nitrate of soda (at seeding), 130 lb. (or such an amount as contains 20 lb. nitrogen).

Superphosphate (at seeding), 715 lb. (or such an amount as contains 90 lb. phosphoric acid).

Sulphate of potash (at seeding), 127½ lb. (or such an amount as contains 60 lb. potash).

Common salt (at seeding), 280 lb.

The Amalgamation of Agricultural Associations.

The multiplication of agricultural, pastoral, and horticultural societies in Queensland of late years has given rise to suggestions for the fusion of two or three or more societies in neighbouring districts into a single central association, with the view more especially to reducing the number of small country shows within easy distance of the large towns. We drew attention to this matter of amalgamation in our issue of January of this year. We pointed out that these country shows are responsible for the marked improvement so noticeable of late years in methods of agriculture and in the improved breeds of horses, cattle, pigs, and poultry, with the further advantage to the local exhibitors and others who profit by what they see, and learn in these directions that they realise larger prices for their stock and produce than they did when they were afforded no means of comparison between their own methods and others more up to date. It was suggested that much benefit would be derived if two or three neighbouring societies would join hands and hold one large show instead of several small ones, by which means the heavy expense connected with the holding of such shows would be proportionately lightened by a combination of the societies to produce one good show instead of three.

The objects of agricultural associations are to advance the interests of the farming industry of a district; to discuss and represent to the Government or to shire councils the desires and needs of the community; to hold annual shows; and to generally guard the interests of the "man on the land."

We note that these matters have been discussed and a circular on various points has been sent out by the Department of Agriculture of the Cape of Good Hope. One point to which attention was drawn in the circular was "The overlapping of activity." Now there is no necessity whatever for this overlapping. An agricultural union has lately been formed in Cape Colony, and this union has, it appears, by an article on the subject from the pen of Mr. A. Haas, of Pokwani, encroached upon the claim pegged out and registered by the Farmers' Congress, and the writer considers that the union should content itself with the very good and important work of attending to agricultural shows and any other work in the agricultural line not already in hand by some other organisation. Fruit-growers' associations seem to always adhere to their professed intention of minding the fruit industry. In a few cases where farmers and fruit-growers are joined in one association, there can be no difficulty, for such a dual association may be affiliated to the Farmers' Congress. As it is, amalgamation could not prevent clashing, for frequently branches belonging to the same central concern hold and express opposite views on a given subject.

With reference to the supposed "Dissipation of Influence," Mr. Haas remarks that influence is chiefly exerted by sound views and reasonable arguments clearly expressed by the demonstration of knowledge and wisdom by those who desire to influence others. Practically, every farmer who is a member of an agricultural society is also a member of a farmers' association; and, on the whole, it cannot be maintained that those members of show societies who are townsmen and engaged in a profession or business could have very correct opinions on practical farming questions. Excepting professional experts, the men personally engaged upon an industry—if anybody—must have the most practical knowledge of that industry's wants, its chances, and successes.

Regarding the statement that "there appears to be no essential difference in the objects sought after by agricultural societies and farmers' associations," there is this very marked difference that many of the most influential members of prominent societies are primarily interested in

exhibiting and finding a market for farmers' supplies—it is plainly the difference between seller and buyer. As, however, farmers are also sellers to the townsmen, the two sides have met on common ground for exhibiting their wares and produce. Beyond this they have nothing in common. The remainder of townsmen associated with show societies are horse, dog, and poultry fanciers, butchers, gentlemen with a hobby, and gentlemen with an ambition. Add farmer members, and you have the sum total. Let the reader say whether, in these circumstances, a union is justified in attempting to duplicate the work for which farmers' associations were first organised. Were amalgamation adopted, the inevitable result would be that farmers' associations and their congress would become disorganised and probably cease to exist for a time. The agricultural societies might gain—perhaps considerably—in strength, but the farmers' interests could not be so well looked after as at present. To carry out the suggestion of amalgamation would mean that, if farmers wish to foster their interests, they could not do so without also supporting show societies and the fruit industry irrespective of the particular branches of farming pursued by them. Very many would feel that they cannot afford this, and hundreds would have to give up their personal interest and work in connection with meetings, because distance would prevent them from attending central society meetings. As farmers' associations are at present constituted, branches need not necessarily consist of more than eight or ten members, a distinct advantage in sparsely-settled districts. While Government is not swayed by outside reasons, political or otherwise, the Farmers' Association of Cape Colony have sufficient weight on their side, and, as a right, can demand the attention of Government; and, as their ranks fill up and their lines extend, the farmers must assert themselves and thus make themselves understood. Influence shall not then be wanting.

Government subsidies to farmers' associations could only be desirable on the distinct understanding that there shall be no attempt at Government control, so that a fearless expression of views, whether *pro* or *con.*, may always be given.

While the finding must be altogether against the suggested amalgamation and centralisation, there is room for improvement. The labours of agricultural societies may well be confined to the holding of annual shows and to other items not having the direct attention of other existing organisations. Let every farmer join some organisation according to kind, and thus foster his own interests and his own business. Let there be as many more agricultural societies and shows as can find support and justification for existence.

The above appeared more amply than we have given it in the "Agricultural Journal of the Cape of Good Hope."

THRESHING OF CEREAL CROPS.

After the threshing of the cereal crops of 1905 at the State Farm, Hermitage, it was ascertained that the yield is at the following rates, returns which, considering the season, may be taken as fairly good. Seed of the barleys and other cereals can be obtained on application to the manager of the State Farm, Hermitage:—Californian brewing barley, 34 bushels per acre; Carter's malting barley, 33·5; Danubian barley, 32·7; Chilian Chevalier barley, 32; Kinver's Chevalier barley, 30·5; Oderbruck barley, 29; Golden Grain barley, 28·5; Hallet's Chevalier barley, 28; Chilian Chevalier barley, 26; English Chevalier barley, 26; Webb's New Golden Giant barley, 24; Hungarian Chevalier barley, 24·8; Invincible barley, 23·3; Belgak oats, 25; 60-Day oats, 22; Ivanov rye, 28; Medeah wheat (a Durum), 15; crossbred wheat, No. 12, 22; crossbred wheat, No. 33, 18·1; crossbred wheat, No. 25, 17; crossbred wheat, No. 349, 16; crossbred wheat, No. 50, 8·8; crossbred wheat, No. 53, 11·5; crossbred wheat, No. 24, 9·3.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 31ST MARCH, 1906.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Beauty ...	Ayrshire	10 Dec., 1905	664	3·6	26·77	
College Lass	,, ...	27 Feb., 1906	817	4·2	38·43	With first calf
Laura ...	,, ...	2 Jan. ,,	823	3·0	27·65	
Lavina ...	,, ...	14 Dec., 1905	824	3·7	34·15	
Lowla ...	,, ...	12 Dec. ,,	738	4·0	33·06	
Ruby ...	,, ...	11 Feb., 1906	712	3·8	30·30	
Hettie ...	,, Sh'rth'rn	28 Jan. ,,	772	4·4	38·04	
No. 48 ...	,, ,,	11 July, 1905	574	4·0	25·72	
Venus ...	,, ,,	22 Oct. ,,	462	4·9	25·36	
Lady Ring...	Guernsey ...	17 Nov. ,,	476	7·2	38·38	
Poppie ...	,, Jersey	11 Feb., 1906	715	5·0	40·04	
Donah ...	Holstein ...	5 Mar. ,,	753	4·0	33·73	
Magpie ...	,, Sh'rth'rn	4 Feb. ,,	1,066	3·2	38·21	
Mona ...	,, ,,	16 Jan. ,,	1,124	3·0	37·77	
Peawee ...	,, ,,	27 Nov., 1905	682	3·8	29·03	
Reanie ...	,, ,,	5 Sept. ,,	673	4·6	34·67	
Night ...	,, Devon...	30 Dec. ,,	762	3·6	30·72	
Beatrice ...	Jersey	22 Jan., 1906	574	5·0	32·14	
Bell ...	,, ...	4 Oct., 1905	474	5·2	27·61	
Carrie ...	,, ...	13 Nov. ,,	621	5·0	34·78	
Cocoa ...	,, ...	9 Oct. ,,	626	5·0	35·06	
Blank ...	,, Ayrshire	7 Dec. ,,	777	4·5	39·16	
Pansy ...	,, Grade ...	22 Sept. ,,	591	4·4	29·12	
Chocolate ...	Shorthorn ...	27 Oct. ,,	746	3·8	31·85	
Count ...	,, ...	19 Dec. ,,	662	4·0	29·66	With first calf
Dott ...	,, ...	8 Sept. ,,	535	4·8	28·76	
Gem ...	,, ...	19 July ,,	430	5·4	26·01	
Gin ...	,, ...	26 Jan., 1906	740	3·5	29·01	With first calf
Glen ...	,, ...	Feb. ,,	717	3·4	27·30	With first calf
Guinea ...	,, ...	Feb. ,,	825	5·2	48·05	
Nestor ...	,, ...	9 Dec., 1905	546	4·4	26·91	
Princess ...	,, ...	1 Aug. ,,	519	4·3	25·00	
Restive ...	,, ...	30 Aug. ,,	515	4·7	27·11	With first calf
Winnie ...	,, ...	2 Oct. ,,	621	4·0	27·82	
Rhoda ...	,, Grade	13 Oct. ,,	602	3·8	25·62	
Grace ...	South Coast ...	19 Nov. ,,	650	4·6	33·49	

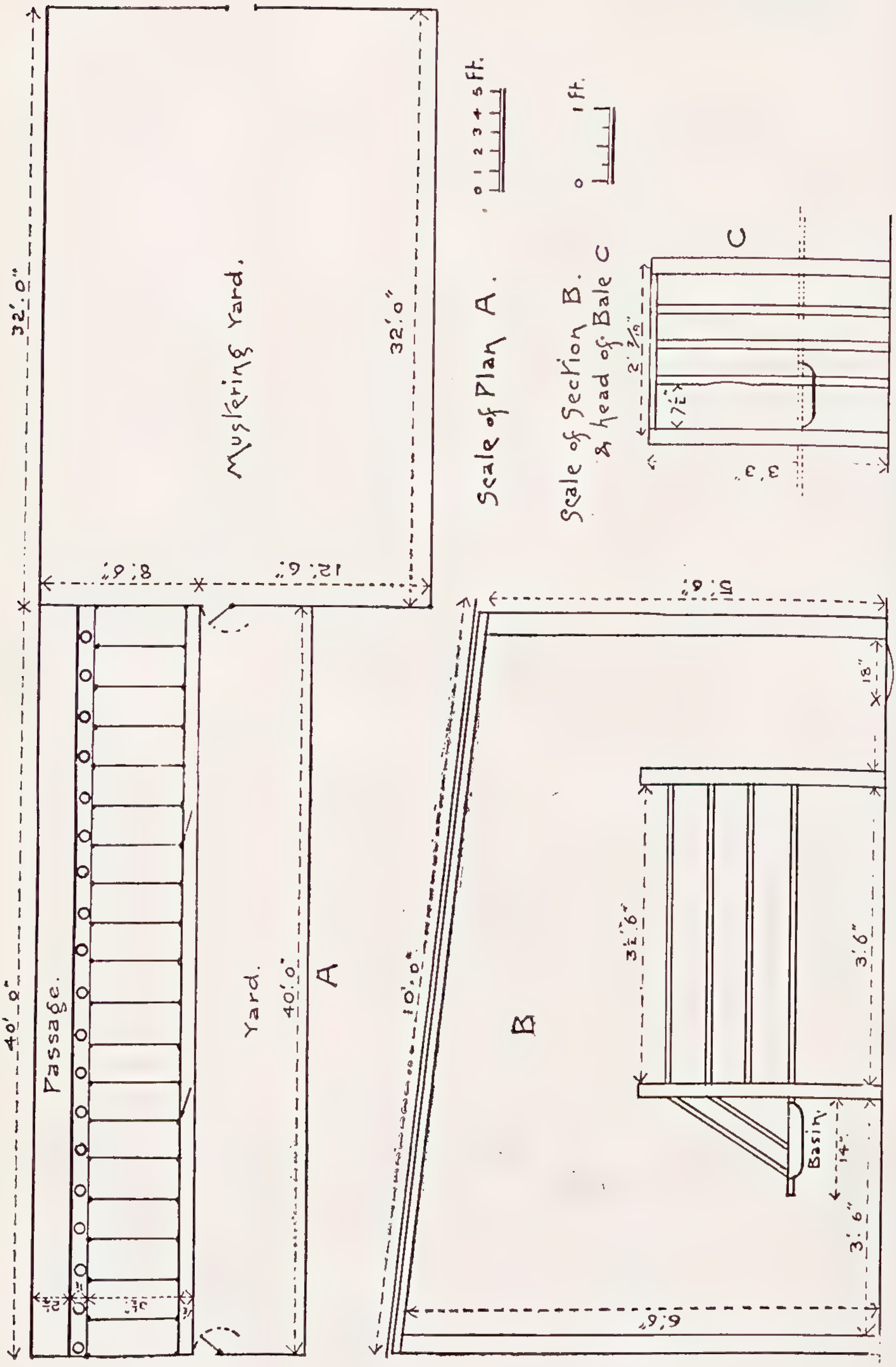
CALF PENS AT THE QUEENSLAND AGRICULTURAL COLLEGE.

From Mr. J. Mahon, Principal of the Agricultural College at Gatton, we have received the following description and items of cost of the calf pens lately erected at that institution:—

Since these pens have been erected there has not been a case of illness of any sort among the calves, and the work of feeding them is completed in a quarter of the time taken to feed them previously. The floor is of concrete, so is easily kept clean, and cleanliness is essential to healthy conditions.

The pens were erected by the students under the direction of the carpenter, who in turn was advised by the Principal, whose idea the pens are, and, though they may cost a small sum to build, the benefit derived will repay the outlay in a very short time.

Plate XXVI.



Calf Pens at the Queensland Agricultural College.

There is really no necessity for an expensive roof or shed over the pens, as the calves are only in the shed a few minutes at a time, so a covering of straw or bush hay would suffice; and, of course, an ordinary farmer would not require the same number of pens, which would reduce the cost considerably.

ROUGH ESTIMATE OF COST.

	£	s.	d.
10 round posts, long bush timber—			
5 about 10 inches diameter and 10 feet long	2	10	0
5 about 8 inches diameter and 8 feet long	2	0	0
4 wallplates (3 x 3), 21 feet long, at 14s. per 100	0	8	9
9 rafters (3 x 2), 10 feet long, at 14s. per 100	0	6	9
200 running feet (3 x $1\frac{1}{2}$) pine, at 6s. per 100	0	12	0
60 running feet (3 x 1) hardwood battens	0	4	0
8 pieces (3 x 2), 8 feet long, at 8s. per 100	0	2	6
200 superficial feet weatherboards, at 14s. per 100	1	8	0
40 superficial feet (3 x 2) hardwood, 10 feet long	1	8	0
960 running feet (3 x 1) hardwood	1	18	6
4 pieces (3 x $1\frac{1}{2}$) pine, 20 feet long	0	7	0
10 feet iron (20 sheets), at 4s.	4	0	0
40 feet ridge-capping, at 4d. a foot	0	13	4
100 running feet (6 x 1) fascia boards, at 12s.	0	6	0
$3\frac{1}{2}$ casks cement, at 14s.	2	9	0
19 basins...	1	0	0
40 running feet (3 x 2) hardwood	0	2	9
240 running feet (3 x 1) pine, for gates	0	7	2
16 panels fencing, at 5s.	4	0	0
2 planks (14 x 1), 20 feet long, for basins	0	5	6
50 running feet (3 x 2) hardwood for yard gates	0	3	6
50 running feet (3 x 1) hardwood ,, ,, ...	0	2	0
Gudgeons and hinges, at 1s. a pen	0	19	0
	£25	13	9

The above is a rough estimate of the cost; but, of course, any farmer could make it for much less.

DEHORNING CALVES.

The growing practice of dehorning cattle has proved very beneficial to the cattle themselves as well as to the owner. We have frequently pointed out the severe injuries which horned cattle inflict upon each other, more especially when travelling in cattle trucks, by accident often as much as of set purpose. The dehorning of mature stock is rapidly performed by the perfect instruments used for the purpose, but how much simpler and how much less painful to the animal is the removal of budding horns from calves by a careful use of caustic potash.

The English Board of Agriculture gives the following directions for use of caustic potash:—Clip the hair from the top of the horn when the calf is from two to five days old, slightly moisten the end of the stick of caustic potash with water or moisten the top of the horn bud, and rub the tip of each horn firmly with the potash for about a quarter of a minute or until a slight impression has been made on the centre of the horn. The horns should be treated in this way from two to four times at intervals of five minutes. If, during the interval of five minutes after one or more applications, a little blood appears in the centre of the horn, it will then only be necessary to give another very slight rubbing with the potash.

The following directions should be carefully observed:—The operation is best performed when the calf is under five days old, and should not be attempted after the ninth day. Caustic potash can be obtained from any druggist in the

form of a white stick; when not in use, it should be kept in a stoppered glass bottle in a dry place, as it rapidly deteriorates when exposed to the air. One man should hold the calf while an assistant uses the caustic. Roll a piece of tinfoil or brown paper around the end of the stick of potash, which is held by the fingers, so as not to injure the hand of the operator. Do not moisten the stick too much, or the caustic may spread to the skin around the horn and destroy the flesh. For the same reason keep the calf from getting wet for some days after the operation. Be careful to rub on the centre of the horn, and not around the side of it. Caustic potash is poisonous, and must, therefore, be kept in a safe place.

Calves that have been treated are from two to twenty months old, and no sign of a horny growth on one of them. It seems a pity that all calves that are to be dehorned cannot be done in this manner, as the operation is very simple and it saves the more serious and trying operation later, both to the animal and the operator, also the expensive instruments.

Bear in mind that the potash burns after you are through with the operation, and that some calves have thin skin and others thick, so that it takes a little experience to determine just when to stop the application of the potash, but it is by far the best way to dehorn.

Times of Sunrise and Sunset, 1906.

Date.	May.		June.		July.		August.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·40	5·3	6·30	5·18
2	6·14	5·15	6 31	5·0	6·40	5·4	6·30	5·18
3	6·15	5·14	6 32	5·0	6·40	5·4	6·29	5·19
4	6·15	5·13	6·32	5·0	6·40	5·4	6·29	5·20
5	6·16	5·13	6·33	5·0	6·40	5·4	6·28	5·20
6	6·17	5·12	6·33	5·0	6·40	5·5	6·28	5·20
7	6·17	5·12	6·34	5·0	6·40	5·5	6·27	5·21
8	6·18	5·11	6·34	4·59	6·40	5·6	6·26	5·21
9	6·18	5·10	6·35	4·59	6·39	5·6	6·25	5·22
10	6·19	5 10	6·35	4·59	6·39	5·7	6·24	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·9	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·36	4·59	6·39	5 8	6·21	5·25
14	6·21	5 8	6 36	4·59	6·39	5·8	6·20	5·25
15	6·21	5·7	6·36	4·59	6·39	5·9	6·19	5·26
16	6·22	5·7	6·37	4·59	6 38	5·9	6·18	5·26
17	6·22	5·6	6·37	4·59	6·38	5·10	6·17	5·26
18	6·23	5·6	6·38	5·0	6·37	5·11	6·16	5·27
19	6·24	5 5	6·38	5·0	6·37	5·11	6·16	5 27
20	6·24	5·5	6 38	5·0	6 36	5·12	6·15	5·28
21	6·25	5·4	6·38	5 0	6·36	5·12	6·14	5 28
22	6·26	5·4	6·39	5·1	6·36	5·12	6 13	5·28
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	6·27	5·3	5·39	5·1	6·35	5·13	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·1	6·33	5·15	6·9	5·30
27	6·28	5·1	6·40	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·40	5·2	6·32	5·16	6 7	5·31
29	6·29	5·1	6·40	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·40	5·3	6 31	5·17	6·5	5·32
31	6·30	5·0	...	...	6·31	5·17	6·4	5·32

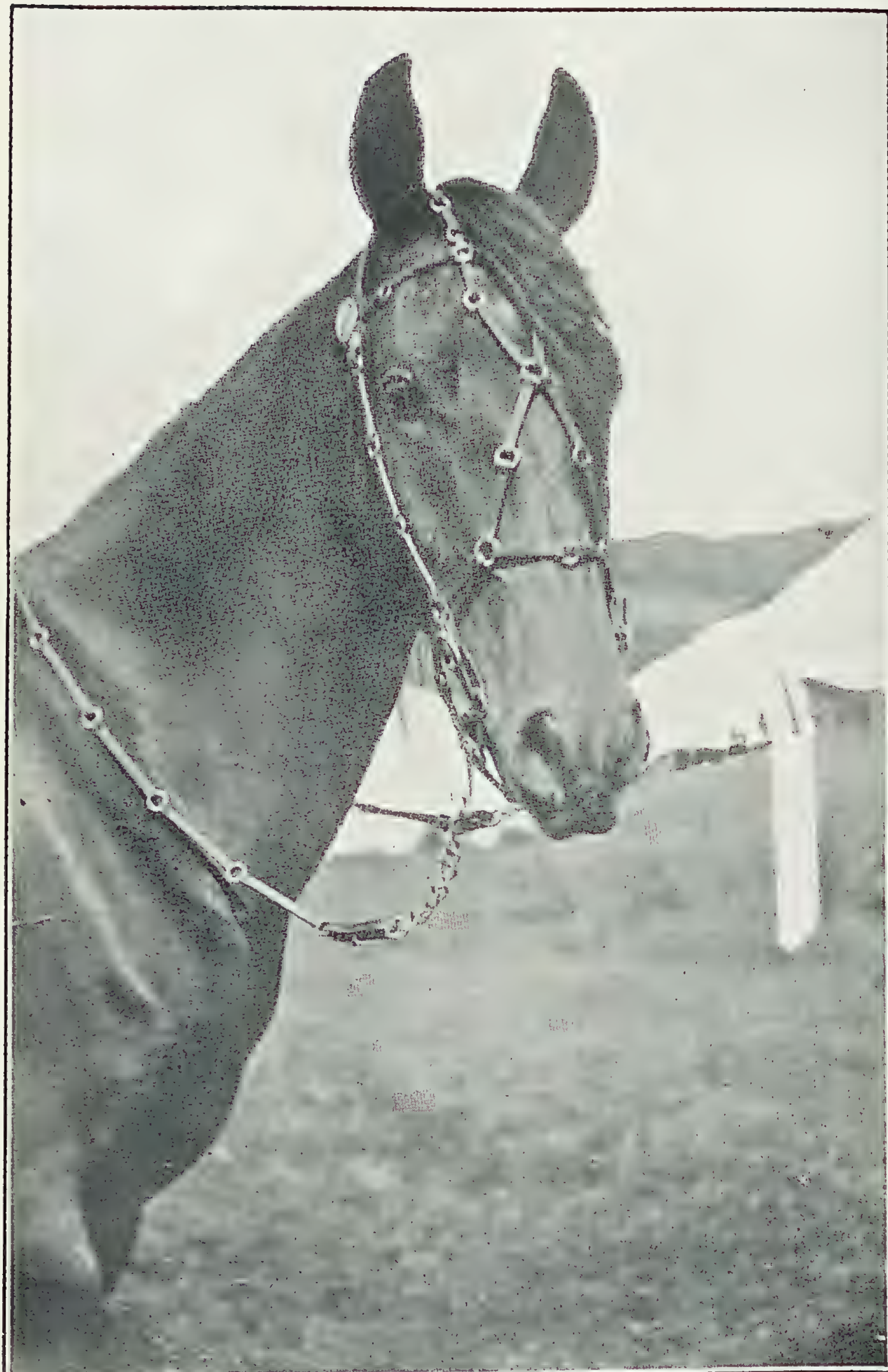
PHASES OF THE MOON.

			H. M.
7 May	☽	Last Quarter	9 50 p.m.
15 „	●	New Moon	8 58 „
22 „	☾	First Quarter	8 18 „
29 „	○	Full Moon	6 54 „
6 June	☽	Last Quarter	3 52 p.m.
14 „	●	New Moon	7 10 „
21 „	☾	First Quarter	1 10 „
28 „	○	Full Moon	6 23 „
6 July	☽	Last Quarter	8 54 a.m.
13 „	●	New Moon	3 27 p.m.
20 „	☾	First Quarter	6 48 a.m.
27 „	○	Full Moon	7 41 p.m.
4 Aug.	☽	Last Quarter	12 2 p.m.
11 „	●	New Moon	10 58 „
18 „	☾	First Quarter	2 27 „
10 „	○	Full Moon	11 2 a.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1906.	Rockhampton.		Townsville.		Cooktown.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
May	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June	1 m.	19 m.	10 m.	44 m.	7 m.	55 m.
July	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.
August	5 m.	15 m.	18 m.	36 m.	16 m.	46 m.

Plate XXVII.



Zedan—Pure-blooded Arabian Colt, Property of the Davenport Farms, Montclair, N.J., U.S.A.

The Horse.

TRAINING HORSES IN EGYPT.

In a very interesting article on the Egyptian horse contributed to the annual report of the Smithsonian Institution by E. Prisse d'Avennes, the following remarkable points are worth noting:—

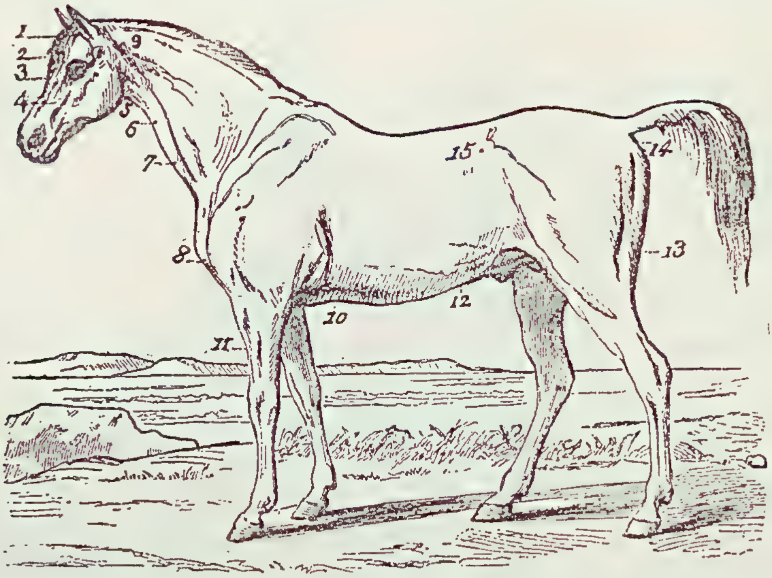
"At present, as a matter of fact, the Egyptian horse is not a very distinct species; they have been bred so at random that they do not retain any of the characteristic forms or traits which would serve to distinguish them permanently. The modern Egyptian horse is below the medium size, but is stocky and well filled out. His head is long, square, and ponderous; his large ears are, as a rule, awkwardly placed; his eyes are little, but expressive; his nose is sloped off sharply, and his nostrils flattened. He has a full chest between a heavy pair of shoulders, which are ordinarily square rather than rounded. His withers are not very prominent. The rump is deeply cleft, the stomach large, the hams and knees strong, the feet broad, the mane and tail coarse and abundant. Bright bay, chestnut, and a dirty gray are the colours usually found. White is not at all common, and black is rarest of all.

"The Egyptians show much consideration in the treatment of their steeds, but the way they raise, feed, and pamper them is not calculated to produce a remarkable breed. On account of this care, the animals are too short-winded to run any great distances.

"The art of horse-training is comparatively but little known among the Egyptians. A colt within a few days after birth is allowed to follow its mother on all excursions. The rider, however, is careful to stop often, so that the youngster shall not suffer for nourishment. Sick or well, the colt is weaned at the end of six or seven months, and then they give him very little food till he is two years old. Moreover, they take no pains about providing any transition from green food to dry. These habits have most deplorable consequences in under-developing and predisposing the animal to all kinds of sickness. Like his predecessors in the days of the Pharoahs, the modern Egyptian does not use his horse for agriculture; he regards it as a useful luxury, and trains it with that idea only in mind. The pace and the gallop are the only gaits that the Egyptians ever teach their horses, and they have hardly any tricks of the horse-trainer. They are generally broken-in on a track or narrow place where they can run at full gallop so close to a wall that they must turn on their hind legs as a pivot, or, what is still more difficult, stop short on their front ones. . . . . In order to correct various bad habits, such as biting, kicking, rearing, the Egyptian employs methods much more efficacious than the mere use of the sharp edges of his stirrups. When a horse bites, they proceed to irritate him, and then present him with a bad leg of mutton just from the fire. The pain that the animal experiences when he seizes this seething viand makes him think twice before biting again. The method of procedure with a rearing horse is equally simple. A horse-trainer, carrying in each hand a heavy water-cooler full of cold water, accompanies his master. When the horse begins to rear, the rider seizes one of the porous jugs and breaks it on the breast of his steed. The shock and the sensation of the cold water soon check any tendencies of that kind."

On the Arabian horse Mr. d'Avennes is enthusiastic, and states that the Persian horse alone can compare in beauty and mettle with the former, for the Persians are as vigilant in guarding the purity of their breed as the Arabians. All the famous horses of history, from that of Richard Cœur de Lion at Medina to that of Napoleon at Marengo and Austerlitz, were "Arabians" or "Barbs." There are natural signs on the Arabian horse which the Arabs regard as significant. The greater parts of these signs are small feathers or "epis," situated

on different parts of the body. An "epi" is a little mark or tuft of hair which makes a slight projection on the horse's hide. The writer gives a list of these "epis," which comprises fifteen positions, as shown in the illustration: 1, 2, 6,



8, 9, 10, 12 are favourable, but all the rest are looked upon as unfavourable or unlucky. Horses with epis on both sides of the tail are execrable. An epi raised on the middle of the forehead like a solitary palm-tree is a sign of great fortune, and is called "the road to happiness."

Other omens are given by the writer, such as:—

"Any horse which has a white star and no white feet will carry you to destruction."

"Horses with black spots on the mouth are unlucky, wicked, and inclined to bite and kick."

"A horse with white on his lips and mouth will run faster than the wind."

"A horse whose white face stops on its nose will rear continually and throw the best of riders."

"If the upper lip is white underneath the gums, it is a favourable sign; if black, it is unfavourable."

"A white mark on each side of the chest, back of the stirrup, indicates speed and safety; they are called 'the wings.'"

"The horse with long white stockings is a dangerous brute. If the white runs higher on the right side than on the left, sell him or prepare your burial garment."

"The horse with the chest of a lion, the hindquarters of a wolf, and the legs of a gazelle, long may he live."

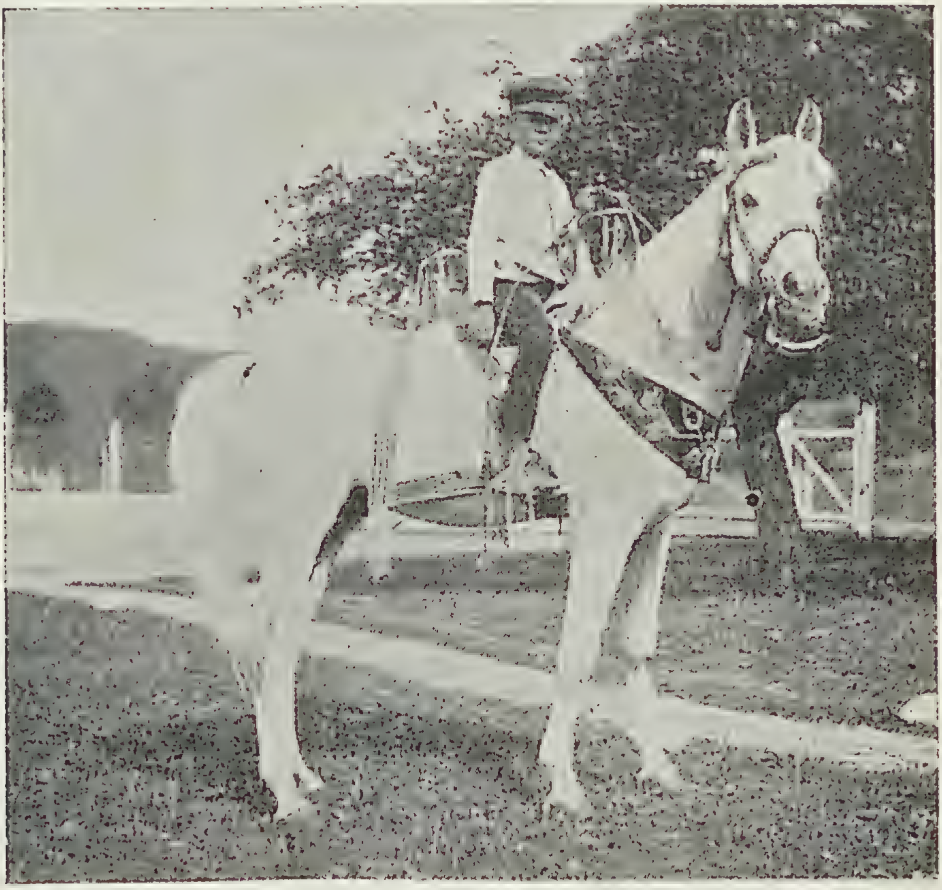
These maxims show, if any such proof is needed, the great care the Arabs display in keeping pure the blood of their royal animal.

The preceding indicates sufficiently the superiority which the Arabian charger has had, and still has, over other races. It is hardly true—as many of our English trained horsemen insist—that the English horse is only the Arabian increased in stature and endowed with other qualities suited to the various exigencies of civilisation. With its growth in size the English horse has lost its long wind, its courage, its sobriety, its endurance, and the suppleness of articulation, all of which are characteristic of the Oriental horse. The Arabian horse runs as well as the English, and if, as they say in England, the Arabian is perfected in that country, it is only by sacrificing all the solid qualities of the thoroughbred Arab to an exaggeration, to a single one—speed—a

quality which Nature has not seen fit to give him as liberally as to more timid animals.

In conclusion, Mr. d'Avennes says that the horse is the expression of society. All the machines man has invented to devour space, though they tend to diminish the necessity for the horse, will never cause him to disappear. In spite of all our progress he will always remain an indispensable utility, and, if only for the use of the army, we should endeavour to preserve the thoroughbred Arabian, the "regenerator" of all other races.

The Arabian horse is easily recognised by a peculiar physiognomy. He has always a remarkable expression, which is not found in any other race, and which seems to signalise him as the type of the species. Head, square and sharply chiselled; large and sometimes bumpy in front—back of skull well developed; eyes, large, prominent, ordinarily very beautiful, with the characteristic black lashes; ears, small, well placed, and mobile; lower jaw, a little strong; forehead, hollow rather than prominent; muzzle, sharp; nostrils, large and susceptible of great dilation when the horse is excited; mouth, of medium



size, with small lower lip. A well-attached head and easy curve of neck and shoulder give elegance to the animal. The neck is long enough to bend gracefully, and, when the horse runs, is thrown back to form what is termed the "stag neck." This conformation, looked upon somewhat as a fault, is natural to all animals who run long distances.

Withers, well filled out; back, narrow; sides, rounded; loins, double and full; hindquarters, long and rounded. Tail, well-placed and carried with vigour and grace. Not above medium size. Articulations, large and strong; the vigorous muscles show plainly beneath the skin. The solid hocks are close-

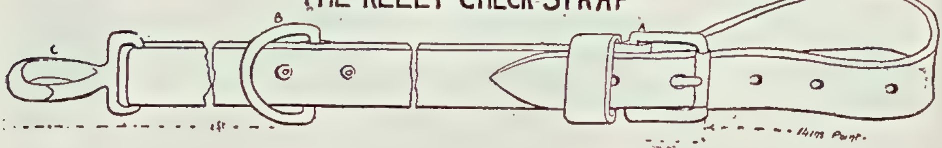
together, a conformation peculiar to swift-running animals like the stag and with detached tendons; shank of front leg, usually short; feet, oval, with very hard black hoofs; hind feet, a little rounded at the back. Mane and tail, not very full. Hide delicate, the smooth and silky skin giving those splended lights never found except in Oriental horses.

The illustrations are reproduced with acknowledgment to the Board of Regents of the Smithsonian Institution, Washington, U.S.A.

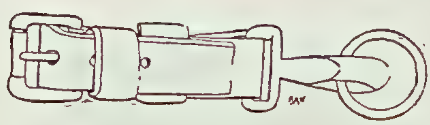
A DEVICE FOR KEEPING HORSES IN CHECK WHEN HARNESSED TO CARRIAGES, ETC.

It is a very common occurrence for horses which are left standing in vehicles unattended whilst the driver opens a gate, or transacts business in a shop, to become startled and to bolt, with often dire consequences to themselves and the vehicle. All drivers, therefore, feel the need of some means of compelling a horse or a team to remain in the place where they have been temporarily left to themselves. The difficulty has now apparently been overcome by Mr. G. H. Kelly, District Forest Officer, Maritzburg, South Africa, who has invented a check strap for holding the horse or horses automatically. The invention, as shown in the accompanying diagram, which we take from the "Natal Agricultural Journal," is simple and effective:—

THE KELLY "CHECK STRAP"



Strap, Hook and Ring



When using the check-strap on a two-wheeled conveyance with one horse, first fasten A around the shaft on the off side, C around the felloe of the wheel, and hook into B. Then put the reins through the loop so formed, and fasten them to the small strap, which should be fixed at the back of the trap. If the horse moves forward, the revolving of the wheel pulls the rein and stops him. If the horse backs, the strain on the reins is released and the wheel locks. When first used, the horse may make two or three backward and forward movements, but the alternate pulling on the reins and the locking of the wheel soon show him that he is mastered.

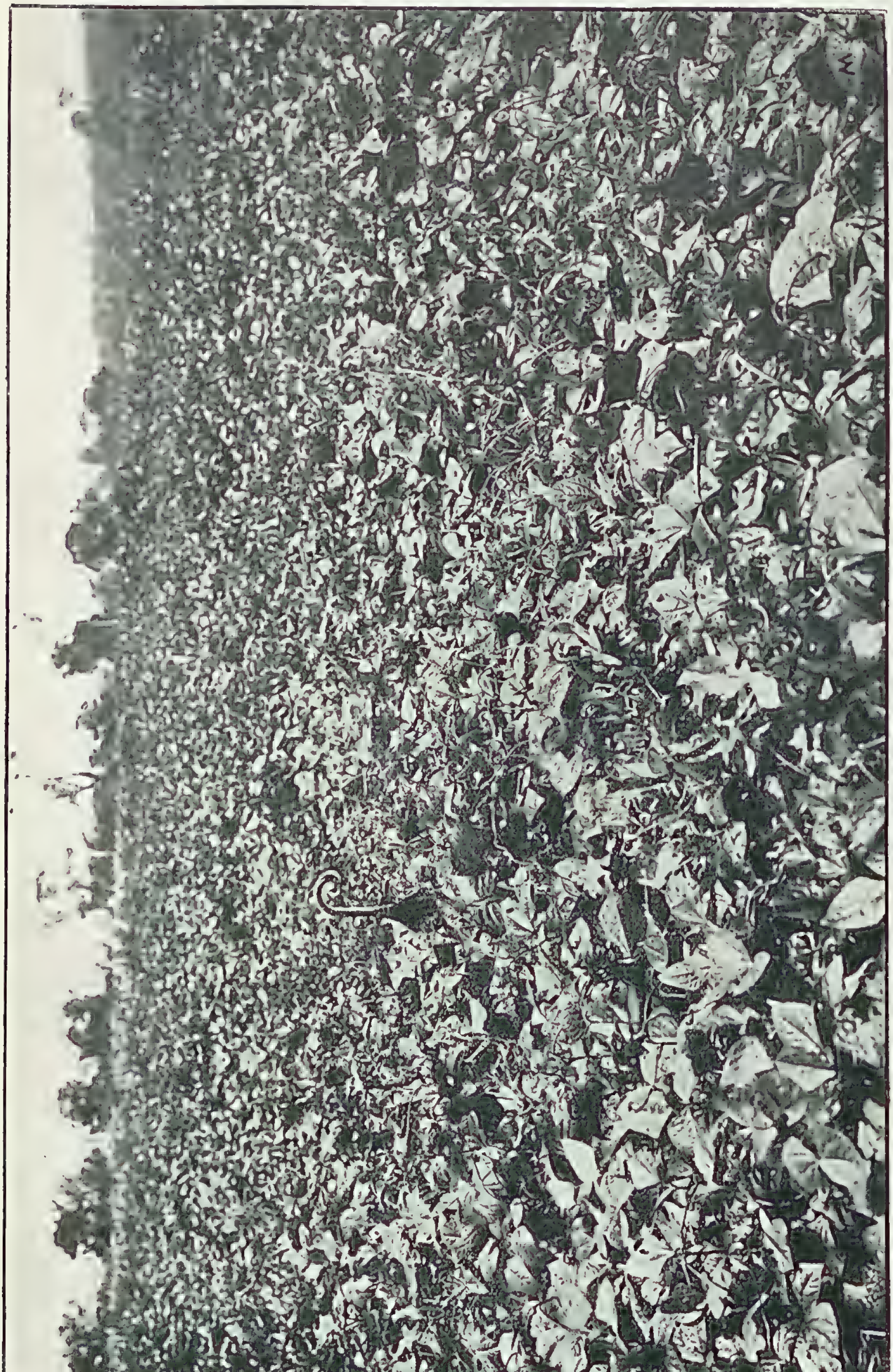
Practically the same procedure applies to a four-wheeled vehicle, but in this case the strap operates best when fastened to the shaft in front of the master bar.

With four-wheeled vehicles having two horses, the same directions are followed, but the check-strap should be fastened to the master bar just on the inside of the bolt which fastens the swingle bar to it.

The whole operation can be completed in a few seconds. The invention has not been patented, and anyone wishing to copy it is at full liberty to do so. We believe that this or a very similar device is in use by one of the stock inspectors of the Agricultural Department of this State.

For a two-wheeled vehicle, the length of the strap between the centre buckles, as shown by the space between the dotted lines, is 2 feet, and for four-wheeled vehicles 14 inches.

Plate XXVIII.



The Orchard.

GREEN MANURING FOR PINEAPPLES.

By ALBERT H. BENSON, M.R.A.C.

The question: "What is the best manure for pineapples?" is a very difficult one to answer, and, in order to obtain reliable information, this Department commenced a series of experiments during the early part of 1905, which are still in progress, and of which full details will be given in due course. The present notes deal with an experiment in green manuring now being conducted at the plantation of Mr. C. Atthow, at Nudgee, on a piece of land that has been under pines for fifteen years, on which rough-leafed pines were doing badly, producing very little root, and dying out.

The plot of pines was manured with various commercial fertilisers on the 27th of February, 1905, but the results from the manures used were practically nil, the plants being too far gone to be brought round. In consequence, it was decided to take up all the pineapple plants on the experimental plot and to put the land under a green crop, which was planted midway between the original rows of pines which had been manured in February. The ground was well watered, and on the 28th of November it was planted with black cowpeas, which were manured with 80 lb. of potash and 40 lb. of phosphoric acid to the acre. The potash was supplied in the form of sulphate of potash, and the phosphoric acid in the form of Thomas's phosphate. No nitrogen was applied, the cowpeas being depended upon to supply all the nitrogen required by the soil. Good rains followed the planting; and when the plot was examined on 24th January, a very fine growth had been made that had pretty well covered the ground. The plants were then coming into flower, and were standing well up, practically no leaves having been thrown down. The plot was again visited on 20th March, when the photograph accompanying these notes was taken by Mr. Mobsby, the artist of our Department.

At this date the first crop of seed had ripened, and there was a large quantity of second-crop seed partly ripe, the pods being of unusual length; picked specimens containing from eighteen to twenty well-developed seeds. The vines had flattened down considerably since 24th January, and there had already been a heavy leaf fall, which was rotting on the ground under the plants. A sample of the plants was taken the same day for analysis, and the total weight of the crop was estimated at over 20 tons of green matter to the acre.

It is intended to plant fresh suckers on the same ground as that previously occupied by the pineapple plants that were manured with commercial fertilisers in February, 1905, and these suckers are being obtained from the Pialba district from strong healthy plants, the idea being to see if it is not possible to so manure a worn-out piece of land that had grown good pines in the past, but which will not grow them now under the ordinary methods of cultivation, that it will again produce good fruit and healthy plants. The crop of cowpeas will be used as manure for this purpose, and it is hoped that the large amount of organic matter and nitrogen that it will add to the soil, in conjunction with the potash and phosphoric acid already applied to it, will so renovate it that it will be brought back to a condition closely resembling that in which it was when first planted to pines. The experiment is a very interesting one to all pineapple-growers, as, should it turn out a success, it will show the means by which land, that may have become what may be termed pineapple sick, can be brought back into good condition for the growth of this fruit at a comparatively small cost. The result of the experiment will be watched very

carefully, and a full report, whether favourable or otherwise, will be published as soon as any definite results have been obtained. The experiments are being conducted conjointly by Mr. Brünnich, our Agricultural Chemist, and the writer; and we are determined to find out, if possible, the best manures for pineapples for the different Queensland soils.

A NEW PROCESS IN DRYING TROPICAL FRUITS.

Although our Queensland fruitgrowers have made several experiments in the way of preserving pineapples for a sufficient length of time to warrant a shipment arriving in London in the best condition, yet full success has not yet been attained. We, therefore, welcome any new process by the aid of which the problem of landing our pineapples, mangoes, guavas, &c., in the British market in good saleable condition may be solved. From the "Fruit Trade Journal" (U.S.A.) we learn of a new process of preserving fruits which may possibly effect the desired object. A Mr. F. C. Nicholas, Ph.D., who is a chemist and mining engineer, reports that as a result of a series of experiments he has perfected a system of fruit-curing well adapted to the tropics, and which it is anticipated will enable planters in southern countries to ship cured fruits successfully and at a very little expense, for Dr. Nicholas, being a practical as well as a man of scientific attainments, has prepared a method for fruit-curing which he says is inexpensive and thoroughly adapted to the requirements of the countries in which it will be used.

Samples of pineapples prepared by Dr. Nicholas at his laboratory, 25 Beaver street, New York, are said to possess thorough keeping qualities, being completely cured and at the same time retaining all the flavour of the original fruit—a condition not found in any of the candied pineapples; and even the canned fruits are insipid when compared to cured pineapples prepared by the new process.

Dr. Nicholas anticipates that his discoveries will serve a useful purpose, and he is now making arrangements to establish a plant for treating fruit. On being asked how soon material could be shipped, he replied that he hoped to see some shipments sent forward during the coming season, but that much was still to be done, and there was urgent need of the co-operation of practical business men to help organise, because it is one thing to develop a new process and quite another matter to utilise it successfully.

FROST PREVENTION.

We have on various occasions given our readers practical suggestions for mitigating or for entirely averting the action of frost on plants.* In Vol. XII. mention was made of spraying as a means of keeping off late and early frosts adopted in parts of Tasmania. The "Tasmanian Journal of Agriculture," writing on the occurrence of frosts, says:—

An interesting method is adopted in parts of California by means of overhead pipes carrying cyclone nozzles, which discharge a jet of water in the form of a mist at a height of 40 feet from the ground. Says Galloway: "The watchman's house is located on that side of the orchard most subject to injury from frost. When the temperature in the orchard falls to 32 degrees an alarm rings, and the watchman turns on the water to all the pipes and spray nozzles. The result is a fog-like mist thrown up by 100 cyclone nozzles over the entire 10 acres in the block of trees thus protected. This mist soon fills the air to a height of 45 feet, and any stir drifts it about like a bank of fog.

* *See* "Journal"—Vol. IV., p. 314; Vol. V., pp. 521 and 529; Vol. VII., pp. 257 and 346; Vol. X., p. 108; Vol. XII. p. 151; and Vol. XIII., p. 538.

"The practice of employing water as a shield against frost, as adopted in some parts of America, has been referred to. The value of this will be grasped when it is recognised that frosts occur as a result of the radiation of heat from the surfaces of plants and the soil on clear, still nights, and when a low temperature prevails. By the use of irrigation water in spring time the temperature of the soil can be lowered and the dormancy of the trees growing prolonged to such a degree that all danger from frost has passed before the opening of the flower buds. In some districts in California furrows are run between the trees, and on occasions when frosts are feared the channels are flooded. No doubt when water is obtainable in abundance much use might be made of its properties in this respect. Some authorities recommend mulching the soil beneath the trees. This prevents surface evaporation, and guards against the ground being frozen. Should this occur, damage may result by the trees giving off moisture through the leaves and not being able to replace the same, owing to the roots' supply being cut off in frozen ground. As has already been pointed out, it is not the freezing but the rapid thawing which disorganises the plant, and if this is striven against by shielding the plant from the morning sun a great deal of harm can be saved. In different hop orchards in the Derwent Valley the high paling fences frequently save the crops from cold, biting winds. The value of Galloway describes some interesting methods in use in different parts of tree-planting as shelter-belts is well recognised by experienced farmers." America for saving crops. One is the production of a heavy smoke over a field on still, frosty nights by burning wet straw, wet leaves, and sawdust. Small fires at intervals give better results than large isolated ones. Gas tar in kettles distributed through a field can also be used. Wickson, in his work on "Californian Fruits," says the use of smoke from fires of rubbish and coal tar to protect vines from spring frost in small valleys is general, and that in the great interior valleys crops of apricots and early peaches have been saved by this method.

Wheeler contends that damp manure smothered with weeds makes the best smudge, and is far ahead of tar and other materials. Kerosene is poured on the heaps, and they are lighted with a torch. He recommends keeping the manure in old sacks, as it can then be moved about easily and keeps dry through rainy weather, so as to be in a good condition for lighting when required.

NEW CITRUS FRUITS.

From time to time the "Florida Agriculturist" has published accounts of some new hybrid citrus fruits produced by the Department of Agriculture; and what follows, taken from the "Tampa Tribune," may be of some interest to those of our new readers who have not seen the reports above alluded to and republished in the "Journal":—

The two great freezes of the winter of 1894 and 1895, which killed to the ground practically every orange and lemon tree in Florida, except in the southern part of the State, of which Tampa is the metropolis, served to emphasise the great importance of securing hardy varieties of these fruits.

Experiments were started by the Department of Agriculture, and the results which have been obtained are very valuable and encouraging. Secretary Wilson, in his annual report, declares that it has been shown that valuable hardy races can be produced by crossing the very hardy cold-resisting trifoliate orange with the different varieties of the ordinary sweet orange.

Two of these hybrids, which were found to produce valuable fruits, were propagated, and in the spring of the present year distributed broadcast to interested growers in South Carolina, Georgia, Alabama, Louisiana, Southern Tennessee and Arkansas, Eastern and Southern Texas, and regions of low altitude in Arizona, New Mexico, Washington, and Oregon.

These fruits, being different from any known group of citrus fruits, were named citranges, and the two varieties were named respectively the "Rusk" and the "Willits." Describing these new hybrids, Secretary Wilson, in his report, says:—

"One of the most interesting of the Department's productions is the new tangelo. This fruit, a hybrid of the pomelo with the tangerine, may be described as a small, loose-skinned ('kid-glove') pomelo. It has a good sprightly acid flavour, which is believed will render it a popular fruit. It has been named the 'Sampson,' and a limited distribution of stock will be made next spring.

"One very excellent variety of sweet orange has been secured, which will probably be propagated and introduced. It is a large, round blood orange, nearly seedless.

"Within recent years the lime has become an important commercial fruit, but as yet the trees grown are mainly seedlings, and the fruits are very variable in shape, size, and quality. Some markets are coming to demand fruits of a certain size, and it is desirable that growers should plant varieties of known characters. Two new seedlings producing fruit uniform in size and of good quality have been secured in the Department's experiments; these will receive names, and will be distributed in lime-growing regions. One of these produces a small fruit, and the other a large fruit. In both cases the fruit is produced mainly near the exterior of the tree, which is a character of importance, as it greatly facilitates the harvesting.

CHECKMATING TEREDO (COBBRA).

The American Consul at Vancouver, British Columbia, has reported to his Government on a recent inspection of machinery for coating wood piles to protect them against the dreaded teredo, by which he appears to have been highly impressed. "I saw," he writes, "40 feet of a pile covered with this new coating in fourteen minutes. The pile was immediately rolled overboard into the water, and as soon as possible was hauled up on the skidway, and the coating had hardened in a few minutes of immersion in the cold salt water so that when struck with a heavy hammer it would ring like a bell."

The machinery is so constructed that the pile when it moves forward turns. The coating is in a tank below the log, heated to boiling point. A web of fabric about 10 inches wide, after being immersed in this liquid for preparation, is wound spirally around the log, one thickness following another, and carrying with it a sufficient quantity of the preparation to make a very thick coating. A heavy galvanised iron wire follows the winding of the fabric under great tension, so that it binds the coating tightly to the logs, whether they be wet or dry. The preparation consists of asphaltum, slaked lime, hydraulic cement, brimstone, crude creosote, asbestos, and sharp sand or granite rock crushed to a sufficient degree of fineness. After an application of the coating, the log passes in front of a machine in which comminuted rock or fine sand, highly heated, is blown upon the coated pile, making a solid outer surface. This preparation being applied at a very high temperature penetrates the wood to a considerable depth, so that it will act in a large measure as a preservative.

The consul adds:—"I saw the pile pounded with a heavy hammer many times without in any way injuring its coating. I am told that a pile thus coated has been driven with a hammer weighing 3,200 lb., with a 15-feet drop, without in any way injuring the coating. I am satisfied, from what I have seen, that this preparation will not be injured by driving nor by the rafting of piles that have been coated."

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order MYRTACEÆ.

EUCALYPTUS, L'Her.

E. Leichhardtii, *Bail.* "Yellow Jack" or "Yellow Jacket." A tree of small size, the timber not considered durable. Bark on the trunk thick, spongy, and somewhat lamellar; colour a light yellowish-brown; deciduous on the smaller branches. Leaves 3 to 6 in. long, falcate-lanceolate, the apex often elongated and filiform, the base somewhat oblique, tapering to a petiole of about 1 in.; transverse parallel veins very numerous, but not very distinct owing to the coriaceous texture of the leaf, the intramarginal one rather distant from the edge. Flowers several together, nearly or quite sessile, in heads which are arranged on thickish (more or less angular) branches of a terminal panicle from 4 to 8 in. long. Calyx-tube thick, angular-rugose, much tapering towards the base in the flower, about 4 lines long and 3 lines broad at the top. Operculum broadly conical or shortly acuminate, considerably shorter than the calyx-tube, usually in the fresh state of a glossy-purple, texture thin and tough; from the centre a descending tube is formed by the petaloid portion or inner membrane which encloses the summit of the style and stigma before the flower expands, similar to what Mueller points out as occurring in *E. eximia.* Stamens 3 to 4 lines long; anthers oblong; cells parallel, opening longitudinally. Ovary flat-topped. Fruit urceolate, about 6 lines long, rim rather thin; capsule deeply sunk, 3-celled. Seeds oblong, about 3 lines long, 1½ lines broad, smooth, flat, and glossy-brown.

Hab.: Near Alice, Central Railway. (Received from Mr. Wm. Pagan, Chief Engineer for Railways.)

The above species seems only to have once previously been brought under notice, and then by Baron Mueller when describing *E. eximia,* in his grand work, "The Eucalyptographia," where he says: "Imperfect specimens, collected by Dr. Leichhardt on Dogwood Creek, in Queensland, and designated 'Rusty Gum-tree,' seem referable to *E. eximia.*"

With regard to the economic value of the wood, Mr. Pagan sent me the following extract from the District Engineer's report:—"During the construction of the line to Jericho a small quantity of it was used in two log culverts on the Main Range, with the sap left on. The borers soon went through the timber, dry rot set in, and the logs had to be renewed within seven years of being put in."

Order EUPHORBIACEÆ.

MONOTAXIS, Brongn.

M. linifolia, *Brongn.*, in Flora Austr. VI., 79. A small glabrous undershrub, with a thick woody stock or rhizome and numerous herbaceous, wiry, ascending or diffuse stems of 6 to 12 or more inches long. Leaves not numerous, opposite or alternate, the lower ones or those of the barren stems small, ovate, or cuneate, and sometimes 2 or 3 toothed, the others quite entire, oblong-lanceolate or linear, usually acute and tapering into a short petiole, green on both sides, and rarely above ½-in. long, without any or with minute tooth-like stipules. Flower-heads (or dense cymes) shortly pedunculate above the last leaves, consisting of about a dozen males, each on a pedicel of ½ to ¾ line, surrounding a single almost sessile female. Bracts minute and scale-like round each pedicel, and a few ovate empty ones forming a sort of involucre. Male calyx of 4 or very rarely 5 ovate-obtuse or scarcely acute segments of about ½-line, very slightly imbricate or sometimes, perhaps, quite valvate in the bud. Petals much shorter, broadly-cordate. Stamens nearly as long as the calyx, usually 8, but sometimes

7 only. Female flower rather larger than the males. Styles divided to the base into 2 fringed branches. Capsule glabrous, about ¼-line long, 3-celled. —Benth. l.c., *M. tridentata*, Endl. Atakta 8, t. 8.

Occasionally when the head has no female flower the rhachis grows out, forming a short, irregular raceme. The arrangement of the flowers in this species shows an approach to that of *Euphorbia*, Benth. l.c.

Hab.: Bundaberg, *J. Keys*. This plant was forgotten when the Queensland Flora was published. Mr. Key's specimen was received in December, 1894.

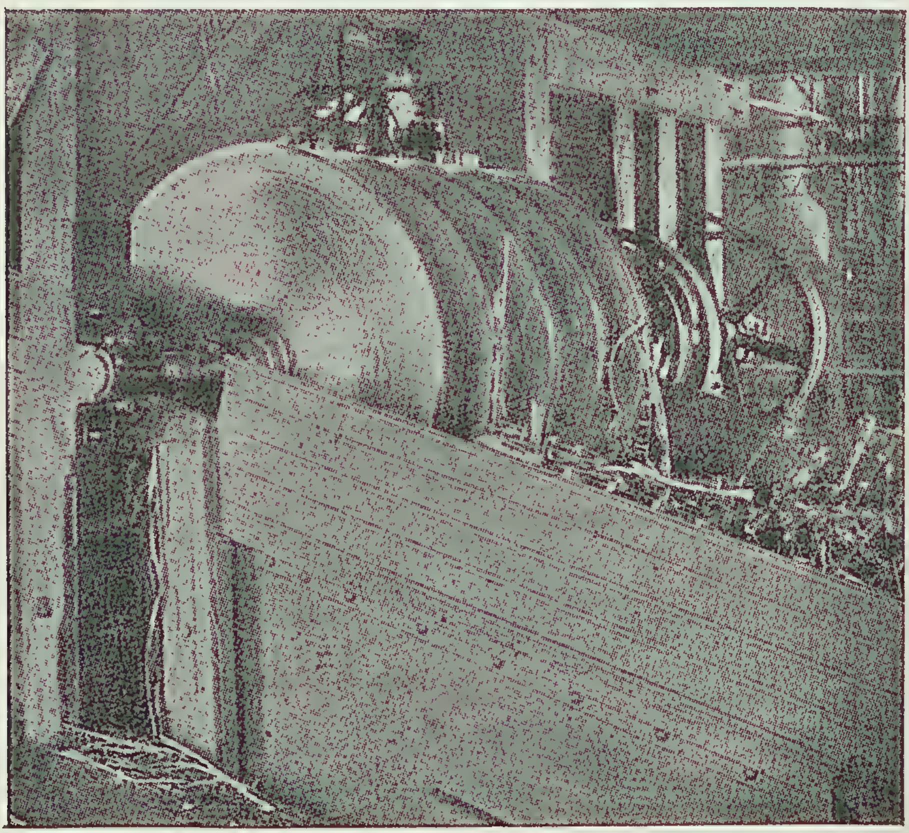
Order FUNGI.

MUTINUS, Fries.

M. pentagonus, *Bail.*; Bot. Bull. X., 35; **var. Hardyi.** The latter is a 6-angular-stemmed form of this curious plant which has lately been met with in the garden of Mr. Geo. Hardy.

Hab.: Bowen Hills, *G. Hardy*. The illustration shows natural size of plant.

THIS apparatus was described in the April number of the Journal.



APPARATUS FOR PREPARING CANE FOR THE MILL.

Plate XXIX.

MUTINUS PENTAGONUS, VAR. HARDYI.

Apiculture.

WINTER CARE OF BEES.

Those who commence beekeeping in the spring will doubtless get along all right during that and the summer season, but it is the now approaching cold weather which demands the utmost care and attention to the bees by the apiarist. As it is the hives which come out strongest in the spring that gather the first surplus honey, so winter should be entered on with the bees as strong as possible, and any that do not cover more than four frames should be joined to some other colony, keeping the better queen of the two. Care should be taken to see that they have sufficient stores and are not likely to be starved out, but in most places in Queensland the bees will be able to gather a little honey for themselves during some warm days in winter. Division boards are useful to economise the warmth of hives by contracting the space, and are made of 1-inch stuff and a little larger than a frame, and hang from the rebate of the hive. One is placed on each side of the cluster; an extra mat should also be put on, and of course the super taken off. The bees should be looked at occasionally, and a warm day be chosen for the purpose.

Before the cold weather comes the supers will be removed and the empty combs stored away where rats and mice cannot get at them; the hives themselves do very well to keep them in, and may be placed one on the other, and the top one covered. The combs should be looked at from time to time to see that there are no bee-moth larvæ in them, as these will spoil the combs if not prevented. The best way to get rid of them is to burn some sulphur underneath the frames, first stopping up any crevices, that the fumes may not escape. Spiders and bee-moths, with ants in some places, are amongst the worst enemies of bees.

ITALIAN BEES.

POINTS OF SUPERIORITY.

1. They possess longer tongues, and so can gather honey from flowers that are useless to the black bee.

2. They are more active, and with the same opportunities will gather much more honey.

3. They work earlier and later. This is true not only of the day, but of the season.

4. They are better able to protect their hives against robbers.

5. They are almost proof against the ravages of the bee-moth larvæ.

6. The queen is decidedly more prolific.

7. The queen is more readily found.

8. The bees are more disposed to adhere to the combs while being handled.

9. They are less liable to rob than other bees.

10. They are far more amiable.

Pure Italian bees should have three yellow bands on the abdomen, although the first band, next to the thorax, is sometimes difficult to see; but a fair test of the purity is the uniformity of the markings of the worker bees of a whole colony.

Tropical Industries.

MOCHA COFFEE.

Some are under the impression that there is really no true Mocha coffee to be obtained outside of Arabia. That this idea is a fallacy is shown by the following article on the subject. The information is given in a United States Consular Report (October, 1905) by Mr. Consul Masterson, of Aden, Arabia:—

I suppose, of all the many kinds of coffee grown, the one and only kind that is unable to compete with other coffees is Mocha. No matter how much greater and better the facilities are for handling and putting coffee on the market than in the past, or how much more the growers may know about the best way of raising coffee, the output of Mocha coffee remains the same, or even less, as the years go by, and, until a complete revolution comes about in the way this crop is raised, handled, and marketed, it will remain the same or grow gradually less.

In favoured countries where coffee plantations are extensive, the labour cheap, and all kinds of mechanical appliances are used for hulling, cleaning, sorting, and packing, the prices are gradually growing less each year. More coffee is coming into the market also by reason of these appliances and facilities, and, as the output increases in other countries, the output of Mocha coffee gradually lessens.

As Mocha coffee is now produced, it is about as cheap in the market as it can well be sold. Anyone who is at all familiar with the coffee market knows that the price of Mocha coffee has varied less than any other coffee within the past ten years, and that, even if the price of other coffees has gradually grown less and less, the value of Mocha has not dropped in proportion because, until conditions change, it is now as low as can be.

RAISED BY THE ARABS.

Unlike the raising of coffee in other countries where we can, without much difficulty, know all about each crop, how much it will likely yield, and the condition of each growing crop, the raising of Mocha coffee is done by Arabs out in the mountainous country of Arabia, where not white man has ever been and statisticians and crop forecasters are unknown. There are no extensive plantations there as we know of them in other places, but each Arab has his own few bushes around his little house, and raises enough coffee for his own use and a little for trading for other commodities. It thus becomes a difficult and slow process to collect from hundreds of people enough to load a caravan. The markets of Aden and Hodeida are several hundred miles from the place where the coffee is grown, and the journey to these markets takes several weeks.

In passing through the different districts under control of some native sheik or Turkish official, this coffee is always subject to a levy, toll, or tariff from each official. Then, when it finally reaches the seaport market, the process of arranging it for shipment is a slow and expensive one. It is always brought in unhulled or just as it was picked from the plant. It is first hulled by passing it between two millstones turned by hand; then it is winnowed and sorted by Indian women, each grain being carefully looked over, and all the uneven or indifferent grains being taken out. It is then ready for packing and shipping. Anyone can see that coffee raised, handled, and marketed in such a fashion can never compete with coffee raised under more favourable conditions, and it can further be seen that Mocha coffee is bound to be of a higher price, and that prices are also bound to remain stationary as long as such conditions prevail.

PROTECTION AGAINST IMPOSITION.

The export of Mocha coffee from Aden for the last ten years has fluctuated in the output, but it has gradually dwindled, with an occasional recovery in

some years; but, as will be seen, the output for the year 1895-6 was considerably greater than for the year 1904-5. The great falling off for the past year is easily explainable, as the bubonic plague was very bad here, and many caravans were stopped on this account. This also explains the small export for the year 1900-1, as there was also plague here during that year. There are two other causes that have contributed to the small export for last year—viz., the war between the Arabs and Turks in the Yemen, and a famine has also prevailed there during that time.

France has, with the exception of one year (1898-9), led in the importing of Mocha coffee, with the United States in the second place, followed by the United Kingdom and Germany in the order mentioned. The local government and the Aden Chamber of Commerce have taken the necessary precautions for protecting the coffee merchants in this place in their business, and no outside coffee is allowed to be transhipped from here, nor is any coffee allowed to be shipped from this port as Mocha unless it is the genuine article. If there is any adulteratng, blending, or mixing, it is done after it leaves this port.

QUEENSLAND TREE COTTON—CARAVONICA COTTON FOR LIVERPOOL.

"Commercial Intelligence," an influential and reliable commercial journal published in London, has the following on Dr. Thomatis's Caravonica cotton which he lately shipped to Liverpool, and which will be sold there before this notice appears in print. We hope to be able to add that the product has reached or even exceeded the price obtained for a sample which the doctor sent home towards the end of 1904—viz., 10d. per lb.:—

Dr. David Thomatis, of Caravonica, Cairns, Queensland, who has raised a new tree cotton with signal success, announces that the cotton he has cultivated in the past season will reach Liverpool in April, and will be sold by public auction, "so that all buyers from Lancashire and the Continent will have a chance to judge of the value of this new cotton."

"My Caravonica is not yet properly understood nor fully appreciated," declares Dr. Thomatis, "and its capabilities and potentialities are still unknown to most." He describes Caravonica as a perennial big tree, simple and inexpensive to cultivate, of great yield, and with power to stand trying seasons, monsoons or droughts, whereas annual herbaceous cotton often perishes either in floods or droughts. One drawback to the cotton is, curiously enough, its excellent quality. In November, 1904, a sample of Caravonica was valued by Messrs. Elliton and Co., cotton brokers, at 10d. per lb., when Bengal stood at $4\frac{3}{16}$, Upland at 6·12, and Egyptian at $8\frac{3}{4}$.

IF QUEENSLAND HAD INDIAN LABOUR.

Not enough Caravonica is at present raised to justify this variety being regularly quoted. As to this, Dr. Thomatis observes:—"I am not a millionaire. I cannot grow millions of bales of it—especially at the Australian wages of 9s. a day, and no man to work even for that! If the people and the Parliament permit the formation of Tropical Territory north of latitude 18 degrees as I have suggested, and allow our Indian Tamils to come over and cultivate cotton, this territory could supply the whole world with Caravonica, and sell it at lower price than Upland or Bengal, and yet pool a large profit." Caravonica, however, is being taken up in India, while Messrs. Brancker, Boswell, and Co., cotton brokers, Exchange Buildings, Liverpool, recently asked Dr. Thomatis for 1 ton of seed for a Brazilian planting company.

The labour question is undoubtedly the great factor in the success of cotton-growing in the tropical North of this State, and we trust that some means may be devised by which a plentiful supply of the right kind of labour may be available for those engaged in tropical industries, either by a regular system of immigration or by other means which need not be here discussed.

Vegetable Pathology.

TOP-ROT DISEASE OF SUGAR-CANE.

We have received from the Colonial Sugar Refining Company, Sydney, the following summary of a treatise by Mr. Henry Tryon, Entomologist and Plant Pathologist of the Queensland Department of Agriculture and Stock, on Top-Rot Disease of Sugar-cane, by Dr. G. Kottman:—

Colonial Sugar Refining Company, Limited,
Sydney, 5th December, 1905.

SUMMARY FROM TREATISE, OF JULY, 1905, ON TOP-ROT DISEASE IN SUGAR-CANE IN THE HERBERT RIVER AND OTHER DISTRICTS OF QUEENSLAND

(In connection with Inquiry made by HENRY TRYON, Plant Pathologist, from 3rd March to 4th April, 1903).

Introductory.—Tentative conclusions formed by the author in May, 1903, found their way into the "Mackay Sugar Journal," the principal ones being as follow:—

The disease has been known for a long time, and is not peculiar to any one variety. It is not a constitutional malady of the plant, but primarily and essentially a root disease due to a chemical change initiated by the secretion of a parasite fungus. This fungus will invade certain parts of the root system if the constitution of the cane has been weakened by abnormal conditions, amongst which the weather plays a principal part. The fungus, however, is able to exist in the soil independently of the cane.

Since then a more comprehensive treatise has been prepared, of which the following is a summary:—

The author refers to the help received from the Colonial Sugar Refining Company, Limited, and the assistance derived from the information supplied by the experts of Java—viz., H. C. Prinsen Geerligs and T. D. Kobus—as well as the several plant pathologists associated with them.

Name of the Disease.—The designations in use are:—

"Cane Rot" (Herbert River district).
"Dry Rot" (Herbert River district).
"Burdekin Rot" (Lower Burdekin district).

Instead of these different names, the author proposes the general adoption of the name "Top-Rot" disease.

Occurrence.—Besides on the Herbert River, this disease is known in the Lower Burdekin and Proserpine districts. The author also noticed in April, 1903, a few stools affected by top rot a short distance from Aloomba, near Cairns; while, according to Mr. L. J. Cowley, it was very pronounced in the "nineties" in the Hambledon section of the same district. The disease may further be identical with that which occurred in the Mackay district in 1899, and was described as having caused a loss of from 25 to 33 per cent. through the rapid rotting of the cane in all the old lands, and in some cases in areas freshly cultivated.

On the Herbert River the disease was noticed as far back as 1891, the crops suffering particularly in seasons 1891, 1895, 1896, 1900, 1901, and 1903.

Damage Done.—There are great variations as to the amount of damage done by the disease, ranging from next to nothing up to extensive destruction. In a few cases the whole crop has been given up as a failure or ploughed out and removed as constituting a danger. In many cases the reduction in the yield has amounted to 20 to 50 per cent. of the prospective crop.

Symptoms.—The disease can first be recognised near the centre of the heart of the stalk or young sprout, some time before the above-ground growth

reveals any outward signs of affection (the heart is the part of the stalk or sprout just above where the youngest and not yet expanded leaves are attached to the very extremity of the stalk).

The leaves, at a very early stage of the disease, are of paler than ordinary colour near the heart, at a time when they are not yet unfolded. Gradually the heart becomes of a yellowish-brown colour, while the just expanding leaves appear to be thinner than usual at their extreme points and somewhat dry, besides being slightly curled (bent over) instead of erect. Somewhat later, the youngest of the already expanded leaves show their extremities pinched and of a brownish hue, with perhaps a yellowish margin, while narrow reddish streaks form on the leaf, particularly near the leaf base. Still later, the heart comes readily out when the top is pulled, its base being rotten and malodorous, while the discolouration and decay spread more and more to the older leaves.

The leaf sheaths exhibit the marks of the disease even at an earlier stage than the leaves themselves; and, furthermore, the discolouration, which indicates the initiation of decomposition, shows earliest at the very base of the sheaths, where the latter are joined to the nodes. Again, the youngest growth becomes first affected, the symptoms gradually spreading to the older leaf sheaths. The red markings, which were already referred to in the case of the leaves, are very pronounced on the leaf sheaths, and particularly bright on the inside, where the latter are in contact with the stalk. They at first appear in bands and streaks, which gradually become enlarged and of a deeper red, later on showing purplish and elongated centres as immediate forerunners of rank decomposition.

The stalks also display conspicuous changes before the expanded foliage reveals the disease; but the leaf sheaths must be well removed in order to be able to see the earliest external symptoms. The nodes and internodes at first appear to be of a brownish hue, the nodes also exhibiting a reddish discolouration. The apex or very top of the stalk is moist and pale-brown, and the joints directly below it are brownish with their surface puckered (wrinkled). Red markings show in the fibro-vascular bundles, which appear as red dots when cutting the stalk transversely. Finally, the rind falls inwards, as if the internal tissue of the stalk had collapsed. These changes of the stalk travel from the top downwards.

All the early symptoms are best recognised after longitudinally cutting through the unexpanded leaves, heart, and stalk.

The buds below the surface of the ground, which are just starting to develop into sprouts, may become affected in addition to the stalks and their leaves. They may even have badly suffered, although their covering looks quite intact, and, on being cut open, may be found to be completely eroded.

This happens particularly in the case of ratoons, though often the proper construction is not put on the matter. Generally, the ratoons so affected are characterised as having "come away badly" (viz., having produced a few stalks only). The presence of top rot in ratoons is, indeed, often difficult to discover.

Simultaneously with the deterioration in one portion of the plant, an acceleration of the growth takes place in another—viz., in the yet sound buds, manifested by their sprouting—due to the diversion of the food supplies into new channels. Such secondary growth, however, is of comparatively poor quality.

Check in Progress of Disease.—The disease is often arrested in its course through climatic or other influences which are unfavourable to healthy development, so that more or less of the upper portion only of the stalk may become decayed, or the cane may even overcome the disease at its very inception.

As a rule, not all the stalks of a cane stool are diseased. It is, indeed, a very remarkable feature that diseased and evidently quite sound stalks are found side by side in the same stool.

With regard to the last two points—viz., the frequent arresting of the disease at one time or other and the existence of diseased and sound stalks in the same stool—the statement of an experienced farmer is of interest, to the effect that he had never seen an entire cane stool killed by the disease.

SEQUENCE IN THE ATTACK OF DIFFERENT GENERATIONS OF STALKS.

The stalks of a cane stool are of primary, secondary, and tertiary growth, resembling a genealogical table. The primary stalks develop from the buds of the mother plant, the secondary ones from the buds of the primary ones, and the tertiary ones from those of the secondary stalks.

In the majority of cases, the primary stalks have been found to have at first evinced the disease. Yet there are many exceptions to this rule.

LIABILITY TO THE DISEASE OF DIFFERENT VARIETIES.

Rappoe and Striped Singapore seem to be more readily affected than others.

Meera is also attacked by the disease, but on account of its rarity not much can be said on the subject.

White Bamboo (synonym of Louzier) has been found diseased, yet a 30-acre field, which had experienced the full effects of the dry weather in 1902, did not show a sign thereof.

Lahaina is said to be immune from the disease, but there was too little of it to verify these statements.

Violet is evidently proof against the disease.

Cheribon (synonym of Otamiti) is said to have escaped all attacks in the "early nineties," when the disease was very prevalent.

Season Favourable to Outbreak.—According to an old cane-grower, top rot shows itself as a rule during the hot weather immediately following the first tropical rains. However, cases are known in which the disease broke out without such rain preceding.

Generally, the disease exerts its greatest virulence about March. It may evince itself even as early as December, and usually makes no further headway after April.

Age of Cane at Time of Outbreak.—The cane often is nine or ten months old when the symptoms of the disease become conspicuously apparent, largely as a consequence of the influence of the time of planting (see later) and the time of the year most favourable to an outbreak. However, supplies planted in place of diseased stools have been known to become conspicuously diseased in March when two or three months old only.

Heredity.—There is overwhelming evidence in favour of the opinion that the disease is not caused by seed obtained from stools which had been partly diseased, nor that it is prevented by the use of seed derived from sound stock. In fact, everything points to this, that the absence of top rot in the seed is one of the minor factors, or is perhaps irrelevant even amongst the influences which bring about the disease. It must, though, be kept in mind that the experience referring to the planting of affected stock has so far been obtained after the planting of seed which is likely to have been procured from the least diseased crops in case sound crops were not available; and, further, that some discretion is likely to have been shown in the selection of the sounder stalks from such affected stock.

DISEASE NOT NECESSARILY A PERSISTENT AFFECTION.

That the disease rarely, if ever, affects the whole stool has already been mentioned.

Further, it is not often noticed in the ratoons, though the "bad coming away" of the ratoons previously referred to may be due to the disease. Badly diseased plant crops may, indeed, be followed by seemingly sound and full crops of ratoons, though it is well to state once more that the latter may actually have been more impaired than was ever suspected. Besides, the very badly affected stools of plant cane have in several instances been ploughed out, so

that the experience as to the persistence of the disease has been limited to the ratoons following the less affected plant crops.

Communicability of Disease.—Some of the more experienced farmers of Victoria Plantation hold that the disease travels from plant to plant. Indeed, it has often been observed that several successive stools of a row were attacked thereby, those of the adjacent rows being uninjured. However, there is not sufficient evidence on this point to be conclusive.

Though in many instances the disease breaks out over and over again on the same fields, there are others showing that it has often not again appeared on the fields on which it had formerly been observed.

Soil Conditions.—Though the soil conditions of the districts in question are too little known physically and chemically, it would seem, generally speaking, that the disease is perhaps more prevalent on sandy than on loamy soils; yet the diseased crops usually grown on soil designated as medium or first-class sugar lands. In fact, several farmers think that the better the land the worse the disease.

However, the physical characteristics of a soil are evidently not a principal factor, the same class of soil in different localities producing both diseased and sound crops.

(The author mentions that Kämmerling, of Java, has shown how two root diseases—viz., "wortelrot" (rot in roots) and "wortelziekte" (root disease), the former appearing at the commencement and the latter at the end of the rainy season—particularly occur there in two classes of soil, which have this in common: That they contain sharp grains of sand or similar bodies, and are not crumbly and mellow. That favouring "wortelrot" (rot in roots) mainly consists of heavy clay, together with some coarse sharp grains of sand, while that favouring "wortelziekte" (root disease) is mainly composed of sharp sand-like particles. Very high clay contents also are pointed out by Kämmerling as favouring root ailments.)

Old and new cane lands evidently suffer alike.

Large quantities of manure, such as compost, may possibly favour the disease, and the same may be said of high humus and nitrogen contents in the soil. Though the experiences do not all point the same way, so much can be said that a low content of humus and organic nitrogen is not the cause of the disease.

Drainage.—The evidence is somewhat conflicting, but, though the disease is said to have been observed in previous years more on the ridges of fields than on the other parts, it is significant that some of these ridges are "spewy" and apt to be soft with moisture, so that horses will sink down in them after wet weather, and that they have a clayey subsoil, which forms basins below, the contours of the ridges and clayey subsoil not agreeing.

The general experience in 1903 certainly favours the opinion that insufficient drainage has much to do with the outbreak of the disease (*e.g.*, a marshy band which crosses a field on Selby's farm showed the disease, while the cane on both sides, and growing on much better drained ground, was free therefrom; the place also where the disease prevailed in 1901 on this farm was in 1903 found to be wetter than the adjoining land). Further, the disease was frequently found restricted to patches occupying depressions and suffering from bad drainage.

Though tile-drained land was pointed out to the author on which the disease was quite as manifest as on undrained land of the same class, it is doubtful whether the principles of proper tile-drainage may have been observed in all cases. One farmer said, "The pipes seem to be choked up, and do not appear to drain the land." Elsewhere, tile drains in more than one instance were observed to be embeddd in impervious clay, or their outlets were not sufficiently deep to drain the soil. But these remarks are by no means of general application, and have reference mainly to the employment of drains as water-carriers only, without consideration of their purpose as aërators. A considerable area of tile-drained land certainly did not show the disease.

Tillage.—On the company's own plantation at Victoria the fields were free from disease at the time of the inquiry (except on two small low-lying areas), and it was suggested that deep and thorough cultivation might partly be responsible therefor.

Yet there is sufficient evidence to show that this alone will not secure immunity, but where the disease existed in spite of deep cultivation on the part of the farmer it was frequently noticed that the soil was rather sandy, the inference being that such soil does not benefit as much from deep cultivation as other classes, because it is apt to rapidly set again.

Time of Preparing Land.—An essential factor may be the difference in the time during which the land is prepared for planting. Generally speaking, the company break their fields up earlier than the farmers do, and in the drier part of the year, so that the stiffer soils on the company's lands do not, on the whole, suffer as much by packing, puddling, and clodding as do those of the farmers

Scarifying the young cane, or working it with the skeleton plough shortly before or during the wet season, is, on the part of the farmers, believed to be favourable to the outbreak of the disease. The ill-effect is attributed to the injury to and the exposure of the roots at a critical time in the growth of the cane. One canegrower even went so far as to assert that deep or excessive scarifying after the middle of November was a mistake wherever the appearance of top rot was to be apprehended.

Ridging and water-furrowing has been experimented on, and the disease was certainly absent in the field so treated, but as there was only little of it generally in the season in question the result must be considered inconclusive.

Nature of Cuttings.—To all appearances, it has been immaterial whether cuttings from plant cane or ratoons have been used.

Insects.—Pou Blanc, or mealy bug, may possibly favour the disease, as plants badly infested therewith have grown into diseased cane. The connection between the two may, however, be incidental only.

The time of planting has evidently a considerable influence on the disease, when all other circumstances are equal.

Roughly, two divisions may be made of the time of planting—viz., early planting, or planting about February and March; and late planting, comprising the time from, say, April to September. The month of April, though, occupies an intermediate position.

It has now been observed that early planted cane on the whole does not suffer nearly as much as late planted cane, and this has not only been the experience during the present but also during previous outbreaks.

The fact that early planted cane has also been known to become diseased does not detract from the importance of this observation, since some of the exceptions can be explained by other conditions favouring the disease, such as the unusual nature or state of the soil.

The saving effect early planting has may be one of the foremost reasons why the cane on the company's fields generally suffers less than that grown by the farmers, though this may to some extent be due to the circumstance that early planting, as already mentioned, allows of a thorough preparation in the immediately preceding dry time of the year, when a crumbly and mellow condition of the soil can be more readily established (and that to a good depth) than soon after heavy rains have fallen.

That early planting, nevertheless, is usually avoided by the farmers may find an explanation in the difficulties connected with completing the work before the advent of the wet season, as well as with the keeping down of the weeds during the latter on freshly-tilled land. These difficulties, to some extent, may owe their existence to the extremly fastidious demands made on the weather by the system of planting which is at present in vogue amongst the farmers.

That the month of April occupies rather an intermediate position between the time for early and late planting has already been mentioned. There is, indeed, sufficient evidence to show that, while planting in April is not as safe as planting in February or March, it does not nearly as much predispose the crops to an outbreak of the disease as still later planting.

Nevertheless, late planting cannot be considered to be the prime cause of the disease. In fact, in the years in which the cane was affected by top rot, there were many healthy but late-planted crops.

The matter must rather be looked at in this light: That late planting, in conjunction with other favourable conditions, may bring about an outbreak of the disease, while early planting will partly or entirely counteract them.

Meteorological Conditions.—That the disease has been noticed mainly in the crops of seasons 1891, 1895, 1896, 1900, 1901, and 1903, and usually become conspicuous about March, has already been referred to.

The rain records for Victoria mill, on the Herbert River, show that in several of those years rather heavy rains occurred in the wet season, preceded by unusually dry weather. Of the two conditions forming this combination, the dry weather preceding the wet season has possibly the greater influence of the two on the outbreak. This also would seem to be borne out by the non-occurrence of the disease on the Johnstone River, with its abundant rains at almost any time of the year; whereas the main playgrounds of the disease—viz., the Herbert and Lower Burdekin—distinguish themselves before other districts by scanty rainfall in the dry season.

Generalising, the meteorological conditions usually favouring the outbreak of the disease may be specified as consisting in an alternation between dry and wet periods, during which the soil is at one time badly dried up and contracted, and at another time packed and swamped, with warm weather existing at the time of the outbreak.

The matter may to some extent be followed up with the help of the table appearing below, giving the rainfall for Victoria mill from 1890 to 1905. (It will be well to keep in mind that the described predisposing conditions need not necessarily find in all cases a strict expression in the number of inches of rain. For all sorts of reasons, the absence or abundance of rain may have a different effect in different years—*e.g.*, heavy rains are likely to have a greater drying and packing effect in warm than in cold weather.)

RAINFALL (INCHES) AT VICTORIA MILL (HERBERT RIVER).

Year.	Preceding May to October (inclusive).	Preceding November and December.	January, February, and March.	April.
1890	16	49	95	10
1891 + ...	17+	5+	77+	24+
1892	17	3	37	1
1893	18	3	34	1
1894	14	15	79	45
1895 + ...	19+	33+	47+	11+
1896 + ...	7+	2+	79+	5+
1897	5	3	31	2
1898	16	20	47	2
1899	5	2	67	7
1900 + ...	5+	2+	39+	6+
1901 + ...	8+	7+	82+	9+
1902	21	5	20	2
1903 + ...	4+	2+	77+	10+
1904	13	41	36	11
1905	6	5	25	18

The figures marked + refer to years for which the outbreak of top-rot disease has been recorded in Mr. Tryon's memoir.

NATURE OF PROCESSES EFFECTING EARLIEST SYMPTOMS OF DISEASE.

The changes near the heart of the stalk, which, as shown, are the earliest signs of the disease, seem to be the consequence of chemical processes, considering that fungi or bacteria could not be discovered in the first affected parts,

and that cell sap taken therefrom failed to develop such organisms by the ordinary hanging drop culture.

These chemical changes effect disorganisation and death of the plant cells concerned. The wounds thus made are invaded by different kinds of wound parasites in the shape of fungi and bacteria. These soon destroy the sound tissue all round by means of the bodies they secrete, and are particularly active in moist and warm weather.

Such destruction will go on until circumstances arise establishing either more unfavourable conditions for the spreading of the fungi or bacteria, or more favourable conditions for the renewal of the plant's vigour, or both (these fungi, though, must not be confused with the root fungus, which is peculiar to the top-rot disease, and will be referred to directly).

Cause of the Chemical Change giving First Impetus to Disease.

We have seen that it is near the innermost growing point of the stalk and at the bases of the youngest leaf sheaths there forming that the presumably chemical change occurs which initiates the disease. This part of the cane, according to Went, contains more tannin, and particularly much more starch than any other; it further does not contain either cane sugar or reducing sugars. This part is also the scene of the most energetic plant life action, and is likely to receive nourishing fluids endowed with some strong chemical properties.

The apparently chemical changes effected there point to the advent of some active body of unusual occurrence, and bring to mind the work of similar agents, such as protease and other enzymes.

There is no evidence to show that such chemically active body has been formed in the stalk, while the latter present some features which would seem to point to the transference through it of chemically active bodies from the roots.

The roots of diseased cane have, indeed, been found by the author to be infested with a peculiar fungus, which at first attacks the very points of the roots and rootlets, thus destroying the water and nutriment-absorbing apparatus of the cane, and then travels upwards from the root points and the ends of the root hairs, causing the roots to thicken in parts.

This fungus is capable of developing outside its host—viz., the roots. It is "naturally a denizen of the soil, and feeds on special organic matter such as cane plant detritus and on humus generally."

This fungus is possibly identical with an unnamed parasite described by Dr. Kämmerling, of Java, as occasionally occurring within the roots of cane affected by the "wortelrot" (rot in roots) disease, which, while principally feeding on perishing parts of the root system, also lives in the growing root ends.

Root-fungus Theory.—There is much in support of the assumption that this root-fungus is the primary cause of the disease, and secretes those chemically active bodies which, after transference through the stalk, act on the peculiarly constituted heart in the way previously described, initiating the decomposition and preparing for further destruction by the wound parasites. Some experiences favour this theory.

As already mentioned, cane "supplies" planted in December and January (at Fairford) in place of diseased stools which had been planted about six to seven months previously, developed the disease as early as March, 1903, or when two and three months old. Consequently, the roots springing from this fresh seed could not have been affected by the preceding drought (which has been recognised as one of the chief apparent conditions favouring the outbreak of the disease), whereas the explanation is not unlikely that the young roots were invaded by the fungus left behind by the diseased stools.

The root-fungus theory would also to some extent explain the experience that cuttings procured from affected stools have grown into healthy cane.

Again, the observation supposed to be made by some farmers, to the effect that contiguous stools of the same row are more often affected than stools opposite each other in neighbouring rows, could be readily understood in the light of the root-fungus theory.

The fact that high humus contents and the presence of much undecayed vegetable matter in the soil appear to favour the disease would further fit in therewith, since the former maintains the fungus parasite as long as it lives apart from its host, whereas an excessive amount of undecayed organic matter is often the consequence of insufficient drainage, and is accompanied by the accumulation of organic acids and similar compounds which may injure the roots and prepare them for invasion by the fungus.

Moreover, the observation made by many farmers that much scarifying and similar work about December and January predisposes the crops to top rot would agree with the root-fungus theory, inasmuch as the cutting and tearing of the cane roots accompanying such work would provide numerous openings for attack. It is just about that time of the year that the roots are developed particularly near the surface, and are thus more liable to damage by implements than at other times.

Even the apparent predisposing influence of certain weather conditions on an outbreak could be readily explained by this theory.

A drought of great drying effect would wither up roots and stalks and weaken their constitution; it would further cause much decaying plant tissue to exist in the immediate neighbourhood of the roots still living, such as would perpetuate the existence of the root fungus in question. Heavy rains following would render the withered roots sodden with water, and it is easy to imagine that roots after such vicissitudes would be an easy prey to a parasitic fungus existing in their immediate neighbourhood.

Early planted cane would suffer less in these respects, because it has benefited more by soil moisture during the earliest stages of its growth, while at the time the severe weather sets in it is already furnished with a deeper and more extensive network of roots, it shades the ground better, and generally has the advantage of being older and more capable of resisting adverse conditions.

The fact that usually not all the stalks of the same stool are affected does not stand in the way of the root-fungus theory, since every stalk has its own particular root system, excepting at a very early stage of its development.

It would, however, be very difficult to prove beyond all doubt the correctness of this theory. The roots of sound cane even are constantly dying, and all sorts of fungi can be found in the decaying roots. Indeed, an exact definition of what constitutes healthy and unhealthy roots has not yet been formulated. Further, absolute proof would necessitate the artificial development of the disease, which, however, "would involve a most tedious and difficult investigation, without any prospect of a conclusive outcome," probably requiring the establishment of "the complex soil and climatic conditions under which the disease operates."

DIFFERENT EFFECTS OF DIFFERENT KINDS OF ROOT DESTRUCTION.

It is well to point out that the injury to the roots by the fungus peculiar to the top-rot disease is marked by an altogether different effect to that caused by some other injuries to the roots. Thus in the case of the grub-eaten cane of Queensland, as well as in that of the "wortelrot" affected cane of Java, the dying off commences with the lowest and oldest leaves, the younger ones coming next, and the heart being the last to go, whereas the opposite applies in the case of cane affected by the top-rot disease.

Top-Rot-Proof Varieties.—From the fact that there is a considerable difference in the resistance of different varieties to this disease, it may be concluded that varieties could be discovered which, besides having other desirable properties, would be proof against top rot. The many varieties some years ago collected by the author in New Guinea and introduced into Queensland on behalf of the Department of Agriculture—amongst them Badila and Goru—might possibly comprise such as these.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

BY J. C. BRÜNNICH, Agricultural Chemist.

TENTH LESSON.

SOIL.—ORIGIN AND FORMATION, CHEMICAL COMPOSITION, CLASSIFICATION OF SOILS.

Wherever the surface of the earth is not covered with water or naked rocks we find layers of **soil,** which consist of earthy substances, more or less disintegrated rocks, mixed with the decomposed remains of animal and vegetable life. Soil itself is particularly adapted to support and nourish growing plants. Soil forms layers of very varying thickness—in some places we find only a few inches of soil, whereas in other localities we may dig through hundreds of feet of soil before we reach the rock, which forms the solid crust of our earth. If we imagine our planet reduced to the size of a dray wheel, the known solid crust of rocks would correspond in thickness to the iron tire of the wheel, whereas the layer of soil may be represented by a strip of the finest tissue paper placed outside on the tire.

When we dig a hole in the ground anywhere, we will find that the appearance of the soil changes as we go deeper and deeper. This change is in some cases quite gradual, whereas in other cases we find distinct layers of soil. As a rule, the **surface soil** is darker in colour, looser in texture, and richer in organic matters than the **subsoil,** on which the layer of top soil rests.

The inorganic or mineral part of soil consists chiefly of disintegrated or crumbled rocks. All rocks near the surface of the earth undergo a continual process of decay or **weathering** under the combined influences of the atmosphere, wind, and rain, changes of temperature, and are gradually broken up into smaller fragments.

Rocks may be classified in various ways, in accordance to the method of formation. Geologists divide rocks into the following classes:—

1. *Igneous rocks,* subdivided again into *plutonic* and *volcanic rocks,* generally hard silicious crystalline rocks, formed by the solidification of fused mineral masses when cooling.

2. *Sedimentary rocks,* formed by either chemical or mechanical precipitation from other rocks, which were suspended in fine division or in solution in water. The layers of mineral matter harden, as they are exposed for ages to enormous pressure.

3. *Metamorphic rocks*—rocks of the previous classes which have been changed considerably under the influence of great heat and pressure.

Based on the structure of rocks, we hear of a classification into—

Crystalline rocks, composed of distinct crystals of one or more minerals—for instance, granite.

Vitrious rocks, fused glassy masses—obsidian.

Colloidal rocks, silicious sinter, incrustations formed in fissures and cavities by deposition of the minerals in solution.

Fragmentary rocks, consisting of fragments of other rocks cemented together—sandstones, conglomerates.

Silica is the chief constituent of most crystalline rocks, forming from one-half to three-quarters of the total mass. Rocks very rich in silica are called *acid silicates,* to distinguish from those poorer in silica, called *basic silicates.* To the class of acid silicates belong the well-known rocks—granite, gneiss, porphyry; whereas basalt is a basic silicate. Rocks may consist entirely of one

mineral, or they may be composed of several minerals in varying quantities. The composition of the minerals itself may also vary. The principal constituent of *limestone* is lime carbonate, but small and varying amounts of magnesia, iron, alumina, and phosphoric acid are frequently present.

Granite consists of a crystalline mixture of three minerals—felspar, quartz, and mica.

The most important minerals taking part in the formation of soils are the following:—

Quartz, pure silica, found abundantly in granite and other igneous rocks. Quartz is almost insoluble in water. During the weathering of rocks containing quartz crystals, by the decomposition of the other minerals, the quartz crystals become loosened, and can be washed away in form of *quartz sand.*

Felspars.—The most important is the *potash felspar* or *orthoclase*, a potassium aluminium silicate, which contains from 10 to 13 per cent. of potash.

Felspars form the most important ingredients of granite, gneiss, and other crystalline rocks. Other felspars contain, in place of potash, soda and lime. Felspars are slowly dissolved by the action of water containing carbonic acid, the potash being dissolved in form of carbonate, and also part of the silica goes in solution, leaving a residue of *pure clay* or *kaolin*, a hydrated aluminium silicate.

Mica is another potassium aluminium silicate, containing generally varying amounts of iron, magnesia, soda, and lime. It is similarly but not so easily decomposed as felspar.

Talc or Steatite, a magnesium silicate.

Hornblende, a magnesium-lime-iron-aluminium silicate—dark-green or black minerals found in basalt.

Gypsum, sulphate of lime.

Limestone, calcium carbonate, found as chalk, limestone, marble.

Dolomite, lime and magnesium carbonate.

Hæmatite, or red oxide of iron, of which the red ochre is a variety.

It must not be overlooked that most of the rocks contain traces of phosphoric acid, due to the presence of small quantities of the mineral **apatite,** a lime phosphate, and this is of the greatest importance in the production of a fertile soil. Granite generally contains about ½ per cent. of phosphoric acid, porphyry and gneiss from ¼ to ¾ per cent., basalt generally a little over 1 per cent. In similar manner traces of sulphuric acid in the form of sulphates are nearly always found in most rocks.

The quality of soil will naturally largely depend on the rocks from which it was formed, and we can easily understand that basalt and similar volcanic rocks will yield a fertile soil, rich in the plant foods—lime, potash, and phosphoric acid. Granite, again, will generally form a good soil, particularly if most of the felspar is potash felspar. Gneiss again, being much richer in the not so easily decomposed mica, produces a poorer soil. Sedimentary rocks like our common schistose or slaty rocks generally give a poor soil.

The action of **weathering** of rocks is due to physical and chemical causes. *Sudden changes* of *temperature*, with consequent expansion and contraction of the stones, will cause a gradual loosening of the crystals. If the temperature sinks below the *freezing point* of water, the water generally present in the small crevices between the crystals will freeze, starting on the outside and closing the opening; the interior as it freezes expands, exerting an enormous pressure, and thus making the fissures still deeper and wider. The *water*, in the form of falling raindrops and as a flowing creek or river, has a mechanical action on rocks, wearing them gradually away. *Wind* has also a mechanical action, which is increased by smaller fragments of stone and sand being blown against the exposed rocks. Particularly far-reaching are the combined attacks of the atmosphere and water. The oxygen of the air will act on the lower oxides (for instance, ferrous oxide), changing them into higher oxides, likewise

sulphides into sulphates. Very characteristic is the change of the dark-coloured, almost black, basalt into the fertile red volcanic soil, found abundantly in many of our farming districts in Queensland. Any freshly broken piece of basalt will soon become covered with a reddish film of rust; the ferrous silicate of the mineral absorbs oxygen, increases very much in volume, and helps in the further breaking up of the basalt, at the same time changing the colour into the characteristic red colour of the ferric oxide.

Water by itself has a distinct solving action on many minerals, which is, however, considerably increased by the absorption of carbonic acid from the air. The alkalies of felspars and mica are dissolved out in forms of carbonates; limestones are dissolved in form of the soluble bicarbonate. Spring and river water contain the mineral matters obtained by the weathering of rocks in solution, and also carry part of the insoluble mineral matters in suspension. The amount of *suspended mineral matters* is considerably increased in rapidly flowing creeks and rivers, and large amounts of solid mineral matters are carried from the higher ground towards the valleys and lower localities. The suspended matters will gradually deposit in the rivers, lakes, and in the ocean; the coarsest and heaviest fragments being always deposited first, the more finely divided sand a little later, and lastly the very finest sand and clay. The deposited masses may again form sedimentary rocks under pressure and by the particles being cemented together by lime carbonate, clay, ferric oxide or silica, and we can thus distinguish between calcareous, argillaceous, ferruginous, and silicious *sandstones*. Sedimentary rocks, consisting of coarser fragments, are called grits, conglomerates, pudding-stones.

Shales and *clay* contain chiefly kaolin mixed with very fine particles of sand, felspar, and ferric oxide. The dissolved matters in the water remain in solution, and are used up and deposited again by aquatic plants, shellfish, and coral.

A not unimportant part in the formation of soil play **earth worms**, which, as Darwin has shown, help in the production of a loose, porous soil rich in organic matters.

Any soil shortly after it has been formed or deposited becomes soon the seat of **vegetation**, which begins generally with the lowest forms of plant life, lichens, and mosses, which sometimes even vegetate on the barest rocks. With vegetation once established, the decomposition and disintegration of the rocks and fragments of rocks proceed at a much quicker rate. The *plant roots* act both mechanically and chemically on the stones. The fine roots force themselves into the finest fissures, enlarging the opening as they grow, and further help by the admission of air and water. The acid liquid which is always secreted by the tips of the roots has a powerful chemical solvent action on the mineral matters of the rocks. The mineral substances dissolved circulate with the sap of the plants, are stored up, and finally returned to the soil after decay of the plants, at the same time enriching the soil with vegetable matters.

Vegetation also protects the soil against the fierce sunlight, and prevents the washing away of the loose soil by heavy rains. Soil left undisturbed for a long time in densely growing scrubs forms the highly fertile and valuable **scrub soil.** Soils which are formed on mountains and hilltops and on their steep sides are liable to be washed away and carried to lower lying lands, where they form plains of valuable **alluvial soil.**

From the formation of soils we have learned that soil consists principally of *Sand*, *Clay*, *Lime*, and *Humus*.

Sand consists partly of grains of pure quartz and partly of fragments of unchanged minerals, like felspars, mica, limestone, &c. Pure silica has very little value as plant food, but the fragments of other minerals are of value, as they can be gradually attacked by the solvent action of the roots, and form thus a store of mineral plant food. Still, sand is one of the most important ingredients of a soil, as it affects very largely the physical properties, and thus indirectly the fertility. Sand makes a soil friable and easily tilled, and for this

reason sandy soils are generally called **light soils**, although the actual weight of such soils is greater than that of the **heavy soils**, which are produced by a larger amount of **clay** contained in the soils. Clay, which in its purest state of kaolin has a white colour, contains in the soils a varying amount of iron oxides, which give the clay a yellowish or a reddish colour. In opposition to sand, clay feels soft and greasy to the touch.

In heavy clay soils the tenacity of the texture is increased by the presence of small amount of clay in a **colloidal** or jelly-like form, binding and cementing the particles of clay, which consist of pure kaolin and very fine fragments of quartz, felspar, together into a putty-like mass. We have already learned that the addition of mineral salts to a clayey water will precipitate or coagulate the clay. A similar process can take place in clayey soils. A clay which contains much of the colloidal uncoagulated clay is always very sticky, impervious to water, and when broken up with the plough leaves large hard clods. Such soils are found in a few parts of Queensland, more particularly in low-lying flats, and are called by the expressive name of *glue-pot soils*. As soon as the colloidal form is changed into a flocculent form, the texture of the soil is changed; it becomes of a more granular texture, becomes pervious to water, and can be reduced to a fine tilth by cultivation. This change of a stiff clay into a light clayey soil is brought about by the addition of lime salts, liming of soils, by heavy frosts, and by heavy manuring with farmyard manure or with green manure crops. The addition of humus in the form of either farm-yard manure or green manure acts quite differently on a sandy soil and on a clayey soil, although it improves the texture in both cases. A sandy soil becomes more coherent by the humus, as the humic acid in the humus has a slight cementing action.

Lime.—The presence of lime carbonate in a soil is of utmost importance, not only by being an actual necessary plant food, but also by its action on the clay in the manner already pointed out. A further important function of lime is in its power to neutralise the acidity produced by the decay of vegetable matters. A land without lime becomes more and more acid, and eventually quite unfit for cultivation. Lime also improves a sandy soil, as, by its slight cementing action, it increases the coherence of the sand. The presence of lime is also of great importance to the process of *nitrification*, which will be more fully discussed in our next lesson.

Humus is perhaps the most important constituent of a fertile soil, as it influences chemical and physical properties of the soil. Humus has a considerable cementing action on sandy soils, and particularly increases the capacity of soil for holding water. If the amount of humus is too high, as in peaty or boggy soils, a strongly *acid humus* may be developed, particularly if the soil is much under water, which will have a bad effect on vegetation. This acidity, however, is easily changed into *mild humus*, if such soils are drained and the air enabled to enter into the soil. Although many chemical substances have been isolated from humus, the exact chemical nature is not properly known. Humus contains from 44 to 50 per cent. of carbon, 6 to 10 per cent. of nitrogen, 3 to 6 per cent. of hydrogen, 28 to 35 per cent. of oxygen, and 4 to 12 per cent. of ash containing chiefly potash, soda, and phosphoric acid.

Classification of Soils.—Many systems of classification have been proposed, but it is a matter of extreme difficulty to draw up a system which embraces all classes of soil. Practical agriculturists have proposed a system based on the actual yields of various crops, which means a classification into *wheat soils*, *barley soils*, *clover lands*, *lucerne lands*, &c., each again subdivided into 1st, 2nd, and 3rd class land in accordance with the crops.

Others again proposed geological classification in accordance with the origin of the soil, and we hear thus of *basaltic soils*, *granitic soils*, *limestone soils*, &c.

A particularly exhaustive classification has been worked out by Birnbaum, who attempted a valuation of soils on points similarly to the judging of cattle. For the classification of a soil he judges it from ten different aspects:—Thickness and situation of surface soil, tenacity of surface soil, ease of tillage, nature of subsoil, absorptive power, moisture, amounts of clay, sand, and humus, chemical composition with regard to amount of plant foods, yield of crops, suitability for various crops. Each of these aspects was again divided into ten classes.

Knop proposed a chemical classification into *silicate, carbonate,* and *sulphate soils*, dividing the first into *aluminium silicate soils, ferric silicate soils, ferrous silicate soils,* and *silica soils.*

A simple practical farmer's classification is perhaps of most use, and is based on the composition as follows:—

	Stones.	*Sand.*	*Clay.*	*Lime.*	*Humus.*
Stony soils	80 % and more				
Sandy soil	...	80 % and more			
Sandy loam ...	...	50 to 80 %	20 to 50 %	under 2 %	
Loam	...	...	50 to 70 %	under 3 %	
Clayey soil	...	10 to 30 %	50 to 70 %	under 2 %	
Clay	...	...	70 to 95 %	under 3 %	
Marl	...	...	20 to 50 %	5 to 20 %	
Calcareous soil ...	...	...	...	20 to 50 %	
Peaty or humic soil	...	...	...	...	20 % and more

In our next lesson on mechanical analysis we will learn that all fragments over the size of a pea (which will not go through a sieve with four meshes to an inch) are classed as stones, whereas anything smaller is called gravel and sand. From the principal groups, sub-groups are easily made. We speak thus of a *stony loam*, containing 50 to 80 per cent. of stones instead of sand. A sandy soil, containing from 5 to 10 per cent. of humus, could be called a *sandy mould.* Again, a clayey soil containing from 2 to 5 per cent. of lime and 5 to 10 per cent. of humus would be called a calcareous, humic, clayey soil. In order to distinguish between texture, we may speak of *light sandy clay* and *stiff clayey soils.* The colour of a soil is generally the indication of the amount of humus, iron, and moisture in the soil. Humus tends to give a dark colour, which becomes lighter on drying. Ferric oxide gives a distinct red tint, which may become a deep chocolate colour in moist soils rich in humus, and in soils poor in organic matters may change into a yellowish colour.

APPENDIX TO TENTH LESSON.

The teacher and student should try and make a collection of various classes of soils from different localities, which can be used for examination and comparison.

QUESTIONS TO TENTH LESSON.

1. What is soil?
2. How is soil formed, and what rocks take part in its formation?
3. Which minerals produce soil rich in potash?
4. What are the causes of the weathering of rocks?
5. What is alluvial soil?
6. Which are the principal constituents of soils?
7. Explain the difference between heavy and light soils.
8. What is the cause of heavy clay being sticky and impervious to water?
9. What is the effect when farmyard manure is applied to sandy soils and to clayey soils?
10. What are the functions of carbonate of lime in a soil?
11. What is humus?
12. Enumerate the various classes of soil from a practical farmer's point of view.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1905.										1906.		
	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
North.													
Bowen	1·17	5·72	0·74	0·53	0·39	0·06	4·03	0·05	3·91	0·04	12·84	8·73	6·29
Cairns	6·81	6·92	3·89	1·94	0·43	2·27	Nil	0·46	1·72	0·53	7·00	16 87	14·59
Geraldton	8·26	20·51	13·35	9 39	2·41	3·88	Nil	0·22	5·44	1·14	15·61	37·67	19·67
Herberton	0·75	2·41	2·67	1·17	0·05	0·89	Nil	0·21	1·69	0·51	15·20	3·73	4·67
Hughenden	0·70	3·84	Nil	0·41	0·47	Nil	Nil	0·13	0·07	0·14	6·11	3·93	8·47
Kamerunga	4·38	8·89	5·63	2·59	1·11	2·16	Nil	0·63	1·05	0·33	7·25	13·76	14·93
Longreach	0·17	2·41	Nil	Nil	0·22	Nil	Nil	0·06	0·77	0·17	3·99	8 61	12·25
Lucinda	2·79	23·06	3·15	1·92	4·14	0·89	0·15	0·68	2·03	0·95	10·13	49 97	25·88
Mackay	3 67	13·19	2·17	1·82	0·95	0·66	0·97	0·08	2·45	0·70	13·58	9·88	14 64
Rockhampton	0·09	8·93	0·95	0·54	0·26	0·51	0·70	0·91	1·05	4·77	4·24	15·31	8·26
Townsville	2·02	6·41	0·52	0·35	0·68	0·06	...	0·52	0·19	Nil	10·05	17·31	4·28
South.													
Barcaldine	0·25	1·56	Nil	Nil	0·30	0·04	Nil	0·15	1·49	1·30	4·00	7·07	13·84
Beenleigh	2·91	3·63	2·21	0·40	0·27	1·12	1·15	2·82	1·76	3·77	4·96	15·11	9·34
Biggenden	3·61	3·81	1·46	0·60	0·28	0·10	0·79	2·56	1·14	11·66	2·27	8·24	4·61
Blackall	2·34	5·02	0·21	Nil	0·68	0·04	Nil	0·29	1·45	0·83	5·13	11·14	11·99
Brisbane	2 65	4·50	1·10	0·39	0·28	0·65	1·32	2·22	3·63	8·21	4·16	12·71	4·85
Bundaberg	3·35	6·31	4·26	1·10	0·71	0·17	0·95	2·37	0·95	6·74	6·92	9·92	1·90
Caboolture	3·57	4·89	1·65	0·26	0·05	0·36	0·98	2·73	2·88	6·72	8·11	12·73	6 63
Charleville	1·67	3·87	0·63	0·01	0·15	0·14	0·09	0·99	0·68	0·12	1·29	10·66	3·15
Dalby	5·46	3·09	2·19	0·25	1·15	0·76	0·14	2·09	1·60	5·67	4·15	4·37	5·02
Emerald	1·76	6·00	0·72	0·06	0·50	0·30	0·29	0·64	4·41	0·80	6·12	7·81	5·22
Esk	1·87	3·52	1·68	0·33	0·52	0·57	0·65	3·21	3·65	5·98	5·49	6·79	9·04
Gatton College ...	1·71	4·22	2·56	0·26	0·98	0·27	0·54	2·59	3·59	4·73	3·75	5·33	9·43
Gayndah	1·58	4·06	1·07	0·42	0·54	0·25	0·30	2·38	1·52	5·58	2 81	9·65	5·86
Gindie	1·74	7·44	0·41	0·11	0·37	0·09	Nil	1·11	3·79	Nil	1·92	9·15	5·92
Goondiwindi	2·53	6·49	1·23	0·55	0·52	0·58	Nil	3·57	1·51	2·72	1·08	2·60	2·19
Gympie	2·00	7·05	4·49	0·79	0·78	0·70	1·85	1·48	1·44	5·03	6·06	7·38	5·58
Ipswich	1·85	2·86	1·98	0·50	0·44	0·78	0·70	2·91	3·32	3·64	5·30	7·22	3·87
Laidley	2·17	4·11	2·59	0·56	0·56	0·61	0·30	2·36	3·59	3·73	3·29	5·63	6·73
Maryborough	2·78	3·48	3·56	1·21	0·07	0·26	1·04	2·48	0·70	4·03	4·46	8·34	6·77
Nambour	3·58	6·65	4·79	1·36	0·05	0·83	1·62	4·70	0·85	5·37	7·01	16·50	9·35
Nerang	5·61	8·98	3·63	0·61	0·27	1·55	1·04	4·59	2·21	5·14	5·01	13·68	10·04
Roma	1·44	2·92	1·72	0·21	0·35	0·31	0·15	1·02	2·15	2·62	2·18	12·95	3·94
Stanthorpe	5·29	2·64	1·63	1·01	0·63	1·77	0·28	3·48	1·94	4·43	6·06	2·76	3·18
Tambo	2 54	5·12	0·12	0·06	0·36	0·46	Nil	0·85	1·57	0·39	5·09	9·05	10·63
Taroom	2·73	6·17	2·22	0·33	0·67	0·31	Nil	0·76	1·11	2·52	1·86	13·73	6·02
Tewantin	3·64	12·43	10·01	2·06	0·22	0·55	1·29	6·57	1·28	6·64	12·07	18·59	7·57
Texas	2·47	3·78	3·07	0·80	0·53	1·09	0·16	3·54	0·94	4·54	3·41	2·11	1·94
Toowoomba	4·17	5·27	3·69	0·65	1·01	0·66	0·61	2·59	2·09	3·20	6·17	6·58	11·75
Warwick	6·20	2·06	2·18	0·77	0·26	1·01	0·41	4·00	2·16	3·98	2·09	2·21	6·27
Westbrook	2·00	1·24	2 54	0·46	0·71	0·61	1·23	2·60	3·62	2·39	5·00	4·01	5·12

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian, choicest, 102s. to 104s.; finest, 96s. to 100s.; New Zealand, choicest, 106s. to 108s.; finest, 100s. to 102s.; Siberian, 106s. W. Weddel and Co. report that during March the demand for Australian butter was good. Of 10,000 boxes from Queensland, 7,740 from New South Wales, and 6,872 boxes from Victoria, very few could be classed as strictly "choicest." For secondary Australian the demand is dull, and prices are in the buyer's favour, as holders are somewhat anxious to clear their floors of this quality. Unsalted butter still meets a good demand at 110s. for "choicest" brands.

The Copenhagen Committee has decided that on and from 29th March current the "overprice" shall be included weekly in the official quotation, and

thus bring the quotation into line with common sense. To-day the quotation is about 8s. per cwt. below the actual price paid, which is absurd. The Committee has again decided to leave the quotation unchanged. This makes the fourth week in succession that the market price has advanced in this country without any rise taking place in the quotation. There is a fair arrival of Siberian butter this week, some of it being fodder-made new season's goods, and not spring grass butter. The quality of some brands is excellent, and they are selling at 106s. Argentine in good quantity arrived this week, and is selling at 106s. and 108s. per cwt., with 110s. for saltless.

CHEESE.—Canadian, 62s. to 65s.; New Zealand, 61s. to 63s. per cwt.

SUGAR (duties, raw, 2s. to 4s. 9d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £16 15s. to £18 10s.; raw, £14 to £18 per ton; German beet, 88 per cent., 8s. 2d. per cwt.

MOLASSES (duty, paid or allowed, 1s. to 2s. per cwt.; for agricultural purposes only, duty free).—5s. to 9s. per cwt.

RICE.—Real Carolina, £20 to £28; Rangoon, £8 to £12; Japan, £13 10s. to £17 10s.; Java, £16 to £20; Patna, £10 10s. to £17 per ton.

COFFEE (in bond, duty 1½d. per lb.).—Ceylon plantation, 50s. to 120s.; peaberry, 55s. to 105s.; Santos, 39s. to 55s.; Jamaica, 100s. to 125s. per cwt.

CHICORY ROOT, DRIED (duty paid, duty, 13s. 3d.).—24s. to 25s. per cwt.

ARROWROOT.—St. Vincent, 2d. to 3½d.; Natal, 3d. to 4d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

MAIZE.—20s. to 29s. per 480 lb. = 2s. 6d. to 3s. 7¼d. per bushel.

WHEAT.—Duluth, 31s. to 34s. per 496 lb.; English, 24s. 5d. to 29s. 11d. per 504 lb.; Australian, 33s. to 34s. per 496 lb.

MALTING BARLEY.—32s. to 32s. 6d. per 448 lb.; grinding, 26s. to 30s. per 416 lb.

OATS.—New Zealand, 22s. to 24s. per 384 lb.

SPLIT PEAS.—42s. to 45s. per 504 lb.

GINGER.—Jamaica, 42s. to 60s.; Cochin, 35s. to 82s.; Japan, 24s. to 25s. per cwt.

VANILLA.—3s. 9d. to 7s. 6d., 7 to 7½ in.

PEPPER.—Capsicums, 14s. to 60s.; chillies, 35s. to 38s. per cwt.; black, 5d. to 5½d.; white, 7⅛d. to 7⅝d. per lb.

RUBBER.—3s. 10d. to 5s. 4d.; Ceylon "biscuits," 6s. 6d. per lb.

GREEN FRUIT.—Apples: South Australian Cleopatras, 19s. 3d.; Rymers, 17s.; Tasmanian Cleopatras, 15s. to 16s.; ordinary (spotted), 9s. 6d. to 14s.; American, 21s. to 26s.; Canadian, 20s. to 26s. per case; bananas, 7s. to 13s. per bunch; pineapples, 3s. to 6s. each. Oranges, Valencia, per 420, common, 8s. to 9s.; medium, 10s. to 13s.; fine selected, 17s. to 21s.; choicest, 23s. to 30s. Lemons, Messina, per 360, ordinary to fine, 12s. to 15s.; finest selected, 16s. to 21s. per case. Grapes, Almeria, from 16s. to 17s. for fine and very fine; 22s. to 23s. for choicest per barrel.

DATES.—Tafilat, 35s. to 40s.; Egyptian, 18s. to 20s. per cwt.; Persian, 10s. 9d. to 13s. 6d. per case.

COTTON.—Uplands, Australian, 6¼d. to 6⅝d.; Sea Island, 13½d. to 15½d. per lb.

COTTON SEED.—£6 to £6 10s. per ton.

COTTON-SEED OIL.—Crude, £17 10s.; refined, £18 10s. to £21 per ton.

COTTON-SEED OIL CAKE.—£4 10s. to £4 17s. 6d. per ton.

COTTON WASTE.—In 5-cwt. bag bales, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

LINSEED.—42s. per 410 lb.

LINSEED OIL.—£19 15s. to £20 per ton.

LINSEED OIL CAKE.—£7s. 10s. to £8 5s. per ton.

OLIVE OIL.—£36 to £40 per tun (252 gallons).

COPRA.—£19 15s. per ton.

COCOANUT OIL.—£28 per ton.

BEESWAX.—Australian, £7 17s. 6d. to £8 per cwt.

LUCERNE SEED.—60s. to 68s. per cwt.

CANARY SEED.—60s. to 62s. per quarter of 480 lb. = 7s. 6d. to 7s. 9d. per bushel.

HONEY.—17s. to 26s. 6d. per cwt.

MANILA HEMP.—£42 per ton (Havre).

SISAL HEMP.—£39 to £40 per ton.

NEW ZEALAND HEMP.—£32 per ton.

FOURCROYA (Mauritius Hemp).—£32 to £35 per ton.

SANSIVIERIA (Murva or Bowstring) HEMP.—£35 to £40 per ton. (Quotations for hemp are for best samples).

DIVI DIVI.—£6 10s. per ton.

TAPIOCA (duty, 5d. per cwt.).—1½d. to 2½d. per lb.; pearl, 12s. to 18s. per cwt

EGGS.—French, 8s. to 10s. 6d.; Danish, 6s. 9d. to 9s. 6d. per 120.

BACON.—Irish, 60s. to 68s.; American, 40s. to 50s.; Canadian, 52s. to 60s. per cwt.

HAMS.—Irish, 80s. to 110s.; American, 48s. to 56s. per cwt.

PORK (frozen).—5½d. per lb.

TALLOW.—Mutton, fine, 32s. 3d.; medium, 28s.; beef, fine, 29s. 9d.; medium, 27s. 6d. per cwt.

POULTRY (Smithfield).—Surrey fowls, 3s. to 5s.; Lincolnshire fowls, 2s. 6d. to 3s. 3d.; Essex fowls, 2s. 6d. to 3s. 6d.; Irish fowls, 2s. to 2s. 6d.; feathered pigeons, 9d.; geese (goslings), 5s. 6d. to 7s.; ducks, 3s. 6d. to 5s.; turkey cocks, 8s. to 12s.; hens, 6s. to 7s.; English hares, 2s. 9d. to 3s.; wild rabbits, 9d. to 11d. each; Australian rabbits, 15s. to 15s. 6d. per crate.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef, of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.

(Crossbred Wethers and Merino Ewes.)

	April 12.	April 21.
Canterbury, light (48 lb. to 56 lb.)	4½d.	4⅛d.
Canterbury, medium (56 lb. to 64 lb.)	4¼d.	$4\frac{1}{16}$d.
Canterbury, heavy (64 lb. to 72 lb.)	4d.	3⅞d.
Southland (56 lb. to 64 lb.) ...	None offering.	
North Island (56 lb. to 65 lb.), ordinary	3⅞d.	3¾d.
North Island, best brands (56 lb. to 65 lb.)	4d.	3⅞d.

Australian Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	$2\frac{15}{16}$d.	3d.
Light (under 50 lb.)	$3\frac{3}{16}$d.	$3\frac{3}{16}$d.

River Plate Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	3⅜d.	$3\frac{5}{16}$d.
Light (under 50 lb.)	$3\frac{9}{16}$d.	3½d.

New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	5d.	$4\frac{7}{8}$d.
Canterbury, medium (36 lb. to 42 lb.)	5d.	$4\frac{7}{8}$d.
Canterbury, heavy (42 lb. to 50 lb.)	$4\frac{3}{4}$d.	$4\frac{3}{4}$d.
Southland (28 lb. to 42 lb.) ...	None offering.	
North Island (28 lb. to 42 lb.) ...	$4\frac{1}{2}$d.	$4\frac{1}{2}$d.
Australian Lambs.		
30 lb. to 40 lb. best brands (28 lb. to 42 lb.)	4d.	4d.
30 lb. to 40 lb., fair quality (28 lb. to 42 lb.)	$3\frac{3}{4}$d.	$3\frac{3}{4}$d.
30 lb. to 40 lb., inferior quality (28 lb. to 42 lb.)	$3\frac{1}{2}$d.	$3\frac{1}{2}$d.
River Plate Lambs.		
28 lb. to 42 lb.	$3\frac{3}{4}$d.	$3\frac{5}{8}$d.
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{11}{16}$d.	$2\frac{5}{8}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{1}{4}$d.	$3\frac{1}{4}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (180 lb. to 220 lb.) ...	$2\frac{3}{4}$d.	$2\frac{3}{4}$d.
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{5}{16}$d.	$2\frac{5}{16}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{7}{8}$d.	$2\frac{13}{16}$d.

QUEENSLAND TIMBER.—Selectors of standing scrub and forest lands should note that, in consequence of the action taken by the Director of Forests in Queensland, there is likely to be a considerable demand for various kinds of hardwoods and pine in the Southern States. Where its destruction can be avoided, such timber should be preserved. The demand for hardwood sleepers for export is increasing, and large quantities of sleepers are already required for the newly-commenced railway lines in Queensland and for replacing worn-out sleepers on existing lines.

ANALYSIS OF PRICKLY PEAR (GIANT MEXICAN, SPINELESS).

	Analysis in Percentage of— Dry Material.	Green Material.
Moisture	...	94·37
Total solid matter	100·00	5·63
Total nitrogen	1·41	·0794
Equal proteids	8·8	·496
Ash	27·2	1·53
Fibre	14·15	·80
Pentosans	11·79	·66
Starch	1·96	·11
Water, soluble extract (cold) ...	41·9	2·36
Water, ash	17·1	·96
Water, carbohydrates (sugars) ...	6·7	·38
Water, nitrogen	·83	·0468
Equals sol. proteids	5·2	·222

The analysis shows the prickly pear leaves contain only a very small percentage of solid matters, which, however, is of a rather more nutritious nature than the solids of grasses. As a food, they should be easily digested, on account of the low amount of fibre and the very high amount of water soluble matters. Mixed with bran, oilcakes, and molasses, a very valuable fodder could be produced.

J. C. BRÜNNICH, Agricultural Chemist.

General Notes.

QUEENSLAND AGRICULTURAL COLLEGE OLD BOYS' UNION.

THE WALLUMBILLA SETTLEMENT.

By PHILIPPE ROCHAT.

Having been asked to contribute to the pages in the "Agricultural Journal" reserved for the members of the Old Boys' Union, I cannot do better than follow the editor's advice and describe the place I have made my home in.

Wallumbilla, 294 miles from Brisbane, on the South-western line, and 25 miles east of Roma, is a village settlement, which, sixteen years ago, was but a sheep walk. To look round about you, you certainly would think the village of longer standing. There are, first, a State school, with two provisional ones at a distance of 5 miles; shops, churches, hall, hotel, grain-shed, and last, but not least, a nice railway station.

The first settlers came in 1889-90, and took up their land under the village settlement system, which permitted them to take up only 80 acres and a ½-acre village allotment. However, before very long, they found that that acreage was not sufficient, as here we are not favoured with the rainfall you get on the coast or on the Downs. So they took up larger selections further out. All that was before my time. I only came here on leaving the College in 1899, having gone through a special course of dairying. Now, the settlement extends 6 miles southward, 4 miles eastward, 9 miles northward, and 6 miles westward. We have three distinct soils—red, sandy loam, chocolate, and heavy black soils. The three of them are as good as any a farmer could wish for, but the last-mentioned is too uncertain for cultivation on account of want of rain. However, when we have a good season, it is the heaviest yielder.

The principal crop is wheat, although by some farmers corn, too, is assiduously cultivated; a few of them go in for a bit of everything—mixed farming. There is a great deficiency in fruit trees. There are several small vineyards, which thrive admirably up here when well looked after.

When I started here myself, I went in for dairying, and advised all the settlers to go in for that branch of farming. I only met with derision, but now things have changed, and they are getting enthusiastic about it. Lately, however, I disposed of my dairy herd on account of pressure of work, and went in for a few merino ewes and Shropshire rams to breed lambs for export, as I think it is better for a farmer who has not a grown-up family. Most of us have between 100 and 200 acres under wheat. The stump jump ploughs—both discs and mould boards—are used. This year we cannot use mould-board ploughs without great trouble, as the cultivation paddocks are covered with high grass, pigweed, and vines. The ploughing just now is in full swing. We sow or plant wheat from now up to the end of June. I find that best results are obtained from the May plantings.

All kinds of wheats are grown, but the bulk is Sullivan's Early, Ward's Prolific, Dart's Imperial, Gluyas and Newmann's, and half a dozen other varieties.

I think it is a great mistake, and it would be far better had we but three different kinds of good drought-resisting wheats. The State Farm being just now formed in Roma will, I hope, facilitate our choice.

At harvest time the machines exclusively used are the stripper and winnower and the complete harvester. It is a great pity that we do not make more use of the reaper and binder, as we have often run short of grass. Good clean straw is not to be discarded. I made use of mine in the last drought we had for my cattle and horses. The cattle milked really well on it, too, and they had nothing else but a little bran with it.

I used to steam the straw a few hours before feeding time, and when giving it to the cows I gave every one of them two quarts of bran well mixed with the damp straw. My plan is to cut the straw after I have been over it with the harvester.

Last year the Railway Commissioner erected a grain-shed of 10,000 bags' capacity, but I am sorry to say we had nothing to put into it, but hope that this year will see it full many times.

Now a few words about dairying, which is in its infancy yet. I am sorry to see farmers milking fairly good cows and not troubling themselves as to what kind of a bull they mate them with. As long as they get their cows in calf, it is all they care for. It is a great pity, as there are some very good cows indeed in the district, and it is a well-known fact among all stockraisers that the quality of the sire is the sure foundation for good stock. I did the testing at the Roma show last year, and the two winners (common cows) gave 2¼ lb. and 2 lb., respectively, of commercial butter in the one day, and the cow which gave most would give fully 2½ lb. on the farm, as she was greatly excited and nervous at milking time.

During the drought we would all have been compelled to leave the settlement, owing to the scarcity of water, had we not had the artesian bore, which is situated 3 miles up the Wallumbilla Creek. The bore was put down 1,200 and odd feet, giving a flow of 25,000 gallons per diem when struck. But lately the flow has decreased, and I am unable to give you a reason for it.

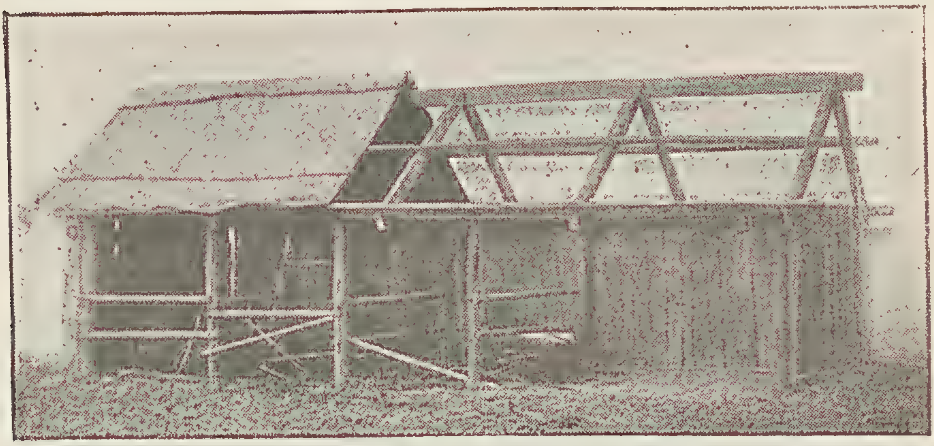
Now we have plenty of both grass and water, and we all hope for a series of good seasons to set us all up on the prosperous grade.

QUEENSLAND SISAL FIBRE.

It is gratifying to learn that Messrs. Muller and Co., of Melbourne, who purchased the sisal fibre produced at St. Helena, have informed the Department of Agriculture and Stock that they are extremely pleased with the quality and get-up of the consignment. They state their willingness to purchase further lots at a good price, and hope that in the near future continuous supplies will be obtainable in Queensland. The number of sisal hemp planters is rapidly increasing all over the State, and the success of the first fibre produced commercially will doubtless act as an incentive to them and others to push the industry rapidly forward. The great difficulty in the way is the scarcity of plants. Many thousands have been supplied to growers from St. Helena, but this source of supply is temporarily almost exhausted. Large numbers of suckers are, however, again appearing, and a considerable number of the older plants having "poled," or sent up the flower stalk, many thousands of bulbils suitable for planting in the nursery will be available in due course. In addition to this source, several planters have plants old enough to produce suckers, and where the latter are not required for the extension of plantations they will no doubt be available for sale. We have heard of several inquiries for land suitable for sisal-growing in the neighbourhood of Brisbane and in the Logan district. A central factory has also been mooted. It should, however, be borne in mind that, although good fibre may be produced from leaves which have been cut for several days, yet after twenty-four hours the fibre is acted upon by the acrid juice of the leaves, and loses much of its lustre and tensile strength, resulting in a decreased price, one great desideratum for the market being the beautiful white lustre of the fibre.

BUSH COW-SHED, STABLE, AND CART-SHED.

The accompanying sketch will give a good idea of a cheap, useful, quickly-erected shed containing cow-bail, horse-stalls, cart-shed, and hay-loft. Many farmers have lately taken up land in situations which entail heavy expense for



the cartage of sawn timber and iron, but all the materials for the erection of a good substantial building are available on most new farms on forest and scrub land. Having regard to the health of farm horses, such an airy stable is far better for them than one which is almost hermetically closed. In the latter the animals are all night breathing over and over again the same air, vitiated by the stable droppings and emanations from their own bodies—a state of affairs good for neither man nor beast. Complete circulation of fresh air is essential to health, and this is obtained to perfection in the bush stable here depicted. Care must naturally be taken to protect the horses from cold westerly winds and south-easterly rains, and that is very easily arranged.

The materials required for this building are—

- 10 round posts, 8 or 9 inches in diameter and 10 feet long.
- 4 wallplates, dressed flat on one side.
- 8 round tie beams, to prevent the sides from bulging and to carry the loft floor.
- 1 ridge pole, dressed on two sides.
- 12 rafters, undressed.
- 8 saplings, as battens to hold the roof.
- 20 sheets of stringy or box bark, 8 feet 6 inches long.
- 100 split slabs.

The gable ends may be closed with bark or light split palings. The hay-loft floor may also be of dressed bark or light slabs. The interior may be subdivided at pleasure. The stable here shown is 33 feet long by 12 feet wide, with a height of 8 feet to the wallplate. The roof has a pitch of 6 feet from ridge to wallplate. With regard to cost, this is restricted to the farmer's own labour and a few pounds of nails. The bark should, if possible, not be nailed to the battens, but fastened with greenhide and a toggle, with stout saplings laid from end to end, slung on fencing wire, or held in position by saplings fastened across them and pinned together above the ridge. These prevent the bark from curling in the sun or being blown off by a gale of wind. In preparing stringybark for roofing, some remove the bark from the tree and lay it out flat on the ground, with the result that it splits, and so is useless for roofing. The bark, on being removed from the tree, should have the outer rough bark taken off with a shovel. Then the sheet should be leaned against the tree, and be fired with the bark shovelled off. If then laid on the ground, it will open without splitting. We may here mention that a farmer near Mount Gravatt lately built such a stable within a week.

THE SEEDSMAN'S DECALOGUE.

The "Journal of the Council of Agriculture," Tasmania, publishes the following quaint "Ten Commandments" for seed collectors, composed by a German agricultural professor, and published in the "Deutsche Landwirthschafts Zeitung":—

1st Commandment.—Reflect thereon that the parent plant and seed bequeath equally their good points and bad points, their virtues and faults, to their offspring, and that it is incumbent on thee, not only for thine own profit, but also for the advancement of Nature, to do thy share towards the improvement of plants. Therefore shalt thou do thy best in this matter, for "the seed is the beginning of life."

2nd.—Thou shalt gather the seed from such plants as outwardly bear the stamp of being true to their species, for the characteristics are evident to the eye. As a man's breeding can be judged from his features, so can the character of a plant be seen.

3rd.—It is the plants coming early to proper maturity which yield seeds that in their turn produce early crops. Therefore thou shalt not collect seed from plants which have run to seed before due time or in any other way are not satisfactory, for the faults, no less than the good qualities, are passed on to the third and fourth generation.

4th.—See also that thou takest the seed from plants distinguished for fruitfulness and for growing crops of the best quality.

5th.—Thou shalt not gather seed from plants that show evident signs of weakness or which suffer from any disease or from insect pests; for the seed may carry the diseases and the pests to the next generation.

6th.—Thou shalt not take seed from a plant grown on a soil which has not been cultivated with a rotation of crops; for an exhausted soil cannot produce a plant bearing seed of good germinating power.

7th.—Neither shalt thou take seed from plants grown upon soil which has been too heavily manured; for luxuriance is always the begetter of vice. Therefore give thou preference to plants grown under natural conditions, for such produce the best offspring.

8th.—Thou shalt not gather seed from those plants which ripen latest; the first fruit yield the best seed. No proceeding is more foolish than that of using the first fruit and collecting seed from plants which ripen last and may be bitten by early frost. Moreover, such late seed possesses less vitality. An old cow gives birth to a weak calf, and an old plant poor seed.

9th.—Thou shalt not take seed from plants near to which plants of the same sort, but another variety, are grown, as this might give rise to a crossing of variety, and such bastards are usually worthless.

10th.—Gather not seed from late-ripening crops on heavy cold soils, for then the seed does not ripen sufficiently before the beginning of winter, and the seed is feeble. On the other hand, thou shalt not collect the seed too soon, and not before it begins to fall out. The ripening of the seed shalt thou further advance by storing the seed in a sunny, dry, and airy place.

Hold thou by these commandments, so shalt thou have pleasure in thy crops and profit in thy work.

WONDERFUL PLANT PRODUCTION.

Most people interested in fruit culture and horticulture generally have heard or read of the remarkable results of the patient experiments of Mr. Luther Burbank, Santa Rosa, California, having for their object the production of entirely new plants and fruits. On his wonderful scientific work the "Agricultural Gazette of New South Wales" says:—

Mr. Burbank is famous for his remarkable productions in the plant world. One of the most wonderful of these is the spineless cactus, which he states

"was produced by crossing a small spineless cactus from Central America with the Arizona cactus and other hardy northern varieties of Opuntiæ. It is not only valuable as a pasture plant, but the fruit will be valuable as a fruit, and will have a delicious flavour. Even the leaves can be fried and eaten—not boiled, but fried in butter." Mr. Burbank considers that it will pay to cultivate his new cactus as other crops are cultivated. The food value is equal to alfalfa (lucerne).

It will grow in moist soil or in situations where there is very little rainfall, and produces heavy crops.

Mr. Burbank has accomplished many other remarkable results in addition to the spineless cactus. Among these may be mentioned the Plumcot, a cross between the plum and the apricot; the Pomato, a cross between the potato and the tomato; the Primus berry, a cross between the raspberry and the blackberry. In addition to the work already accomplished, Mr. Burbank has now over 2,000 different experiments going.

The Carnegie Institute of Pittsburg, Pennsylvania, has granted Mr. Burbank an endowment of £20,000, to be paid at the rate of £2,000 a year for ten years, to enable him to conduct his costly experiments free from any financial worry.

Reference has been made in the "Farm Stock Journal" to a number of Luther Burbank's successful experiments in obtaining new or improved fruits, nuts, flowers, and vegetables.

Among his successes is the production of two new species of walnuts, which, says Garrett P. Serviss in the "Cosmopolitan Magazine," "may bring about a revolution in the world of trees."

One, called the Paradox walnut, is remarkable for the swift growth of the tree. The surprising statement is made that it grows faster than any other tree in the temperate zone. A row of this variety was planted thirteen or fourteen years ago at Mr. Burbank's home, and some of them have in that time developed trunks 2 feet in diameter with immense tops. Still more surprising is the fact that, contrary to one almost universal result in fast-growing trees, these Paradox trees are remarkable for the hardness and durability of their wood, which has been compared to lignum vitæ for solidity, and has beautiful colour, making it valuable for cabinet-making and house-building.

The tree is also capable of developing new varieties without losing its distinctive characteristics, and Mr. Burbank expects that many novel cabinet woods will eventually come from it which will add immensely to the timber wealth of the country. It is not much of a nut-bearer, and its chief value is in the rapid growth and superior wood qualities.

But Mr. Burbank has developed a half-brother of the Paradox walnut, called the Royal walnut, which grows immense crops of large and sweet walnuts. The former is a cross of the California black walnut and English walnut, and the latter a cross of the California and Eastern black walnuts. The nuts of the Royal are four or five times larger than those of its parents, and also have sweeter meats.

HOW TO CLEAN A BUGGY.

All owners of such vehicles as buggies, pony-traps, or cabs know what a difficult matter it is to perfectly clean them after travelling through mud and slush. They are hosed down, washed with a cloth or sponge, and yet when dry the polished wheelspokes and bodies appear smudged and unclean. To overcome this, try a recipe given in "Australian Farm and Home." It is this:—

After washing the mud, dust, &c., from your buggies, carriages, and wagons, let them get dry. Then take linseed oil and saturate a sponge or cloth and go all over the buggy. You can see at once the effects. It will take the mud stains and spots all away, and give the buggy a gloss and appearance of a new vehicle. We have practised this for quite a while, and it gives good results.

TO EXTRACT A SPLINTER.

When a splinter has been driven into the hand, it can be extracted by steam. Fill a wide-mouthed bottle nearly full of hot water, place the injured part over the mouth and press it slightly. The action thus produced will draw the flesh down, and in a minute or two the steam will extract the splinter as well as the inflammation.

CURE FOR RHEUMATISM.

From an exchange we take the following simple remedy for rheumatism, which is vouched for by a lady who was a martyr to rheumatism and sciatica. The remedy is "cotton-batting," or cotton wool in sheets. For weeks she had suffered from sciatica, and, remembering that she had seen cotton wool used for rheumatism successfully, swathed her leg in it from hip to toe. In less than a week she was up and about the house. The pain left entirely, and did not recur. Acute rheumatism and obstinate neuralgia will yield to the same treatment. When the pain has ceased, the wrapping should not be removed too suddenly, as the parts which were covered are very sensitive to cold. Therefore, something less bulky should be worn for a little time after removing the cotton batting.

NEW DIRECTOR FOR KEW GARDEN.

In succession to Sir William T. Thiselton Dyer, K.C.M.G., who lately resigned the position, Lieutenant-Colonel D. Prain, Director of the Botanical Survey of India, has been appointed Director of the Royal Botanic Gardens, Kew. It is stated that the post of Assistant Director at the Royal Botanic Gardens, Kew, is to be revived. It is also expected that considerable developments will be made in the Departments of Forestry and Agriculture, and, it is hoped, in the study of plant diseases.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

CONTENT OF A SILO.

J. RUDGE, South Coast Line.—

One ton of silage will occupy 50 cubic feet. Thus, all you have to do is to calculate the cubic content of your silo by multiplying length, breadth, and height into each other; then divide by 50. If your building is 18 feet long, 18 feet high, and 13 feet broad, it will hold about 85 tons. It will take about 6 acres of green maize to fill it, and will supply fodder for more than a dozen cows for several months.

COLT WITH HERNIA.

GILBERT, Gilbert River.—

I have a well-bred foal, three months old—a colt. He is badly ruptured about the navel, the protrusion being about the size of a 1-lb. jam tin. I find the protrusion is easily put back, but instantly comes out again. Can you advise any remedy? The colt is unstabled, just running in a paddock, and would have to be roped. So a truss would hardly answer. Would the rupture come against the colt if kept for a stallion? which I intended to do.

Mr. A. H. Cory, M.R.C.V.S.L., Government Veterinary Inspector, advises postponing treatment until the colt is nine or twelve months old, as the hernia may become much smaller as the animal grows older. If treatment is then necessary, fast the animal for a few hours; then cast and secure it on its back. The bowel is then carefully returned into the abdomen. The skin over the internal opening should be gathered up with the hands, and special clamps applied. An adhesion is soon established between the skin and the umbilicus, which effectually closes the orifice, and the clamps fall off. Obtain the clamps from an instrument maker.

HARICOT BEANS.

J. E. KNIPE, Wooroolin.—

1. An open situation, light rich soil, well dug, are required for this crop.
2. Plant from September to April.
3. $1\frac{1}{2}$ bushels will sow an acre. Sow in drills 2 feet apart at from 1 to $1\frac{1}{2}$ inches in depth. Plants should be 8 inches apart in the rows.
4. When ripe, gather and thresh, winnow and bag.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	APRIL. Prices.
Apples, Eating, per packer, Hobart	7s. to 8s.
Apples, Eating, per packer, Hobart, best sorts	10s.
Apples, American, per packer	...
Apples, Cooking, per packer	8s. to 9s.
Apples, Local, per packer	...
Apricots, quarter-case	...
Bananas, per dozen (scarce and demand local grown)	$2\frac{3}{4}$d. to 3d.
Bananas, per dozen	...
Grapes, per lb.	2d. to $3\frac{1}{2}$d.
Cherries, quarter-case	...
Comquats, case	...
Lemons, per case, local	5s.
Lemons, per case, Imported	6s. 6d.
Mangoes, half-case	...
Oranges, per packer, Imported	...
Oranges, Local, per packer	3s. 6d. to 4s.
Passion Fruit, quarter-case (scarce)	4s. 6d.
Papaw Apples, per case	...
Peaches, quarter-case	...
Peanuts, per lb.	$2\frac{1}{2}$d.
Pears, Imported, per case	...
Pineapples (rough leaf), best sorts, per dozen	2s. 6d.
Pineapples (smooth leaf), best sorts, per dozen	4s. to 4s. 6d.
Plums, Imported, quarter-case	5s. 6d.
Plums, Local, quarter-case	...
Persimmons, quarter-case	5s. 6d. to 6s. 6d.
Quinces, Imported, per case	6s.
Strawberries, per quart	...
Tomatoes, quarter-case	1s. 6d. to 2s.
Watermelons, per dozen	...
Rockmelons, per dozen	...

SOUTHERN FRUIT MARKET.

Bananas, Fiji, per case	10s. to 11s. 6d.
,, ,, per bunch	2s. 6d. to 5s. 6d.
Lemons, per gin case	...
Oranges, per double case	4s. to 7s.
,, Washington Navels, per double case	...
Pineapples, case	5s. to 9s.
,, per double case	...
Rockmelons, case	...
Peaches, half-case	4s. 6d. to 5s. 6d.
Tomatoes, half-case	1s. 6d. to 3s.
Quinces, per case	2s. 6d. to 4s. 6d.
Chillies, per bushel	4s. to 4s. 6d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL.

Article.		APRIL. Prices.
Bacon (Pineapple)	lb.	$6\frac{1}{2}$d. to $9\frac{1}{2}$d.
Barley, Malting	bush.	4s.
Bran	ton	£4 12s. 6d. to £4 17s. 6d.
Butter, Factory	lb.	$8\frac{1}{2}$d. to $8\frac{3}{4}$d.
Chaff, Mixed	ton	£3 2s. 6d. to £3 10s.
Chaff, Oaten	"	£4 3s. 9d. to £4 7s. 6d.
Chaff, Lucerne	"	£3 10s. to £4 2s. 6d.
Chaff, Wheaten	"	£2 7s. 6d.
Cheese	lb.	6d. to $6\frac{1}{2}$d.
Flour	ton	...
Hay, Oaten	"	£5 5s. to £5 15s.
Hay, Lucerne	"	£2 2s. 6d. to £2 14s. 2d.
Honey	lb.	2d. to $2\frac{1}{4}$d.
Maize	bush.	2s. $5\frac{1}{2}$d. to 2s. $7\frac{1}{2}$d.
Oats	"	2s. 9d. to 3s.
Pollard	ton	£5 to £5 5s.
Potatoes	"	£7 13s. 9d. to £10.
Potatoes, Sweet	"	...
Pumpkins	"	£1 2s. 6d. to £2.
Wheat, Milling	bush.	...
Wheat, Chick	"	3s. 2d. to 3s. 9d.
Onions	ton	£8 to £8 7s. 6d.
Hams	lb.	9d. to 10d.
Eggs	doz.	$11\frac{1}{2}$d. to 1s. $5\frac{1}{2}$d.
Fowls	pair	1s. 10d. to 2s. $9\frac{3}{4}$d.
Geese	"	5s. 3d. to 5s. 9d.
Ducks, English	"	2s. $3\frac{1}{2}$d. to 2s. 8d.
Ducks, Muscovy	"	2s. $11\frac{1}{2}$d. to 3s. 6d.
Turkeys, Hens	"	4s. 7d. to 6s. $4\frac{1}{2}$d.
Turkeys, Gobblers	"	7s. $1\frac{1}{2}$d. to 10s. 9d.

ENOGGERA SALES.

Animal.	MARCH. Prices.
Bullocks (Extra Prime)	£10 17s. 6d. to £14.
"	£9 to £10 12s. 6d.
Cows (Extra Prime)	£7 10s. to £9 5s.
"	£6 12s. 6d. to £7 15s.
Merino Wethers	20s. 6d.
" Ewes	17s. 3d.
C.B. Wethers	22s. 6d.
" Ewes	19s.
Lambs	16s.

Orchard Notes for June.

By ALBERT H. BENSON, M.R.A.C.

The marketing of citrus fruits is still one of the principal operations in many orchards throughout the State, and the remarks anent this matter that have appeared in these notes for the past two months should be borne in mind and acted upon, as, no matter what the quality of the fruit may be, it always sells best when well packed and attractively got up, as the better it looks the better it sells.

I cannot lay too great stress on the extreme importance of handling the fruit carefully and of sweating it prior to shipment. The common practice of pulling the fruit from the tree and packing and shipping it straight away is responsible for a very large proportion of the loss so commonly met with in marketing the fruit early in the season. The skin in the earlier stages of ripening is rigid and full of moisture, so that it is easily bruised, the cells of the skin being ruptured. Fungus growths of various kinds attack the injured skin, with the result that the fruit soon becomes completely rotten, and is covered with a mass of greenish or bluish mould. This loss can be reduced to a minimum by cutting the fruit instead of pulling it, and by handling it like eggs instead of like road metal. In addition to the ordinary loss on the fruit by bad handling, a further loss takes place when it is found necessary to cyanide the fruit, as, for example, when it has to be shipped to the Southern States, as the gas at once finds out every bruise, case-mark, or injury to the skin, such as plugging—viz., pulling the stem out—and turns the same black, thereby greatly detracting from the value of the fruit.

In many parts of the State deciduous fruit trees should be pruned during the month, and I strongly advise fruit-growers to read my remarks on this subject which appeared in a previous issue of this "Journal," as thorough pruning is seldom carried out, many trees being allowed to grow of their own sweet will without let or hindrance. This neglect to properly prune fruit trees is conducive to the rapid spread of many insect and fungus diseases, as when trees are allowed to grow into a dense bush it is impossible to keep them clean by means of any of the ordinary methods adopted for the eradication of disease, such as spraying, &c.; and when they are allowed to straggle all over the place, the straggling limbs are very apt to become more or less diseased.

Old neglected trees of good varieties, and of which the roots are still healthy, should be cut hard back, and all dead, broken, or badly diseased branches should be cut off and a new head be allowed to form; but where such trees only produce inferior fruit that is of no commercial value, they should be either destroyed or, if wished, they may be grafted on next spring with good valuable varieties. Old neglected trees are the breeding-grounds of many diseases, and when they are of no value whatever they should be destroyed, as they are a menace and source of infection to the neighbourhood in which they are growing.

Do not be afraid to prune too heavily, as it is better to lose a crop and thereby get your tree or trees into a healthy state than to leave them in an unhealthy and unpruned condition and get a poor crop of inferior fruit. Prune hard, and gather up and burn all prunings; do not let them lie about, but burn them up, as by doing so any diseases that may be on the wood that has been pruned off will be destroyed. Where trees are hard cut back and only the main limbs are left, it is advisable to follow up the same pruning with a dressing that will destroy all insects or fungus pests still remaining on the tree, and for this purpose the best remedy is to paint the stems and branches with the following mixture, prepared thus:—Boil 2 lb. of sulphur and 1 lb. of quicklime in 2 gallons of water for about one hour, then add fine clay to the

mixture till it is as thick as paint, and apply with a brush. Fine flour can be used in the place of the clay if desired, and will render the mixture more lasting.

Where San José, Greedy Mussel, or Parlataria Scales are present, this method of treatment is the most efficacious, and is even better than spraying with the sulphur, lime, and salt wash mentioned in my pamphlet on spraying. This mixture is also of value for painting the stems and main branches of citrus trees covered with mosses or lichens or attacked by White, Red, Circular, Black Mussel, or other scale insects.

Where the ground is ready, plant deciduous trees this month; do not plant too deep, and cut back hard at planting. Clean up the orchard thoroughly, and plough and leave the ground rough as soon as the trees are pruned and the prunings are burnt. Gather up and destroy all fly-infested fruit of all kinds, as the more thoroughly the fly is kept down during the winter on the coast, the fewer flies there will be to deal with in spring. Where not already done, see that pineapples are protected from frost, and keep the ground between the plants well worked in order to retain moisture, as the winter months are usually dry and the plants are liable to injury through drought. The same remarks apply to bananas, and the unripe bunches of fruit should be protected from slight frosts or cold spells by any suitable available material.

Farm and Garden Notes for June.

Farm.—Although frosts will, in all probability, have already occurred in some exposed parts of the South-western districts, yet winter does not practically begin until the 24th of the month. Insect life is now dormant, and weeds are no longer a serious trouble to the farmer. Hence, now is his time to sow lucerne. Sometimes a dropping season in May will start a growth of weeds, but this should not act as a deterrent, as the lucerne will in all likelihood overcome the now slow-growing weed crop. Rye, prairie, and other grasses may also now be sown. Oats, barley, vetches, clover, tobacco, buckwheat, and field carrots and swedes may now be sown. Those who propose to sow millets, sorghum, panicum, &c., should begin to get the land ready for these crops. Some advocate the sowing of early maize and potatoes towards the end of the month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern district and on the tableland neither maize nor potatoes should be got in before the end of July or in August. There is always a probability of frosts during these months. Arrowroot will be nearly ready for digging, but the bulbs should not be taken up until the first frosts have occurred. Dig sweet potatoes, yams, and ginger. Sweet potatoes may be kept, should there be a heavy crop, and consequently a glut in the market, by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the potatoes out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand. Then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them. Then put down another layer of tubers, and repeat the process till the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Wheat for late harvesting may still be sown. It is too late for a field crop of onions. In tropical Queensland, the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes

may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

KITCHEN GARDEN.—Asparagus and rhubarb may now be planted in well-prepared beds or rows. In planting rhubarb, it will probably be found more profitable to buy the crowns than to grow them from seed; and the same remark applies to asparagus.

Cabbage should be planted out as they become large enough, also cauliflower, lettuce, &c.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnips, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschallots, if ready, may be transplanted, also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost; for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses, and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open border if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondii*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 inches apart.

Agriculture.

ABOUT MANURES.

Year by year, owing to constant cropping and want of attention to suitable rotations, our soils are becoming deteriorated. Those elements so important to the health and life of all field and garden crops—viz., nitrogen, phosphoric acid, and potash—are gradually but surely being diminished in quantity, and if not replaced by some means or other, the result is inevitably an impoverished soil, and, as a natural corollary, an impoverished farmer. There are, undoubtedly, soils of such surpassing richness in all parts of Queensland that, although some of them, on the Darling Downs, have borne over thirty successive wheat crops without rest or manure, they still yield from 20 to 30 bushels of good grain per acre. But all soils are not so constituted, and in order to keep up their fertility, the use of manure becomes imperative. Of the chemical bodies (writes Mr. J. C. Brünnich, Agricultural Chemist) carbonic acid, water, phosphoric acid, nitrogen, potash, lime, magnesia, iron, and sulphuric acid—which are all absolutely necessary for the growth of a plant—not all need to be applied in the form of artificial manures, but only those which are shown by practical experience, to be more quickly exhausted, and which are generally found in only small quantities in the soil, as phosphoric acid, potash, and nitrogen.

Our commercial manures are, consequently, chiefly composed of these chemicals, their value depending entirely on the amount and on the form in which the chemical compounds are found in the manures. Enormous quantities of artificial manures are used on the Continent of Europe. In the Canton of Berne, Switzerland, the amount of important plant foods put back on the land in the form of stable manure alone amounts to 4,700 tons of phosphoric acid, 24,000 tons of potash, and 19,600 tons nitrogen, thus proving that the land was robbed of more than half of its most valuable constituents, for whilst, in addition, 1,300 tons phosphoric acid, 240 tons potash, and 93 tons nitrogen were supplied to the land in the form of artificial manure, the average crops grown took out of the soil 12,000 tons phosphoric acid, 41,000 tons potash, and 36,000 tons nitrogen. If this happens in a country where agriculture has reached a high perfection, how much more disastrous must be the result of such cultivation as generally practised in our State of Queensland. Some of our farmers have manured, but it has been done in a blindfold and reckless manner. The farmer purchased, perhaps, a few bags of meatworks' manure, superphosphate, and guano, and applied them alone or mixed, without getting any result, and, of course, wisely abandoned further trials. In continuation of this subject, we commend to our readers Mr. Brünnich's valuable paper published in this Journal in October, 1900, under the title of "What Kind of Manure Should I Use?"

Following, we give some further useful notes of manures from our exchanges:—

APPLICATION OF SUPERPHOSPHATE TO THE WHEAT CROP.

It used to be the general custom to give the crop the benefit of an autumnal artificial dressing of 2 to 3 cwt. of superphosphate just before or at the time of sowing, and this is still the practice which obtains on the Continent. Moreover, it would appear to be in accordance with the views of agricultural experts. Thus, at Rothamsted, when it is thought desirable to apply phosphate of lime, a dressing of 2 cwt. is ploughed in before the seeding operation, and another authority recommends an autumn dressing just before sowing of 2 to 3 cwt. superphosphate per acre.

As opposed to this plan, the practice has grown up in this country of broadcasting the superphosphate in the spring, probably being found more convenient, and to answer equally well.

The wheat plant wants its supply of nourishment most when vegetation starts after its winter rest, and during the months of February, March, and April (August, September, and October, in our State) absorbs about three-fourths of the fertilising constituents required during its whole period of growth, and it appropriates greedily the quantities not only of nitrogen applied as nitrate of soda in the spring, but also the soluble phosphoric acid of the superphosphates and potash.

Nitrate of soda, applied alone, acts too quickly and with too stimulating a force; the plant should have at the same time phosphoric acid available to its rootlets.

It is told of a successful farmer that, clothed in a loose coat with two enormous pockets, one containing nitrate of soda and the other superphosphate, he used to walk over his fields of wheat in the spring, and wherever he saw a patch looking weakly or yellowish, indicating insufficient nourishment, he used to spread a handful out of each pocket, with the remark that he was mending his crop, and, as a matter of fact, he nearly always succeeded in getting a good crop.

A very suitable dressing is 2 cwt. superphosphate mixed with $\frac{3}{4}$-cwt. of sulphate of ammonia, applied this month, and followed up in August, if the appearance of the growing crops indicate the want of it, by $\frac{3}{4}$-cwt. of nitrate of soda.

If the soil is of a chalky character, deficient in potash, $\frac{3}{4}$-cwt. of sulphate of potash should be mixed with the superphosphate and sulphate of ammonia.

After heavy rains it may be expected that a proportion of the plant foods have been washed out of the soil, and, therefore, an artificial supply, such as we have above indicated, would seem to be desirable.

Decomposition of Manure.

The decomposition of manure depends largely upon the amount of moisture in the heap. When manure is dry the chemical changes occur slowly, but more rapidly when the heap is wet. When manure is mixed with a liberal supply of absorbent materials, and stored under shelter, it will undergo but little change, but when wanted for use it may be decomposed in a short time if saturated with urine. If the bedding used in the stalls is cut fine it will serve the purpose desired fully as well as when uncut, but the main advantage is that the fine material may be more intimately mixed with manure, and will then better absorb the liquids, to say nothing of the easier handling, loading, and distribution of the manure on the fields when the season arrives for spreading it. Much of the value of manure is lost by mismanagement. The quantity of manure made by a cow in one year is very large, especially if all the liquids and solids are saved. With the use of litter it is claimed that a cow will make a ton of manure a month, but this estimate includes the absorbent materials of the litter, which serve to prevent loss rather than to add anything of value to the manure.

Manure from One Cow.

It is estimated that one cow will produce 14 tons of manure in a year, including the bedding, and that the cost of the manure will be about 4s. a ton. Its value, however, depends upon the kind of food from which it is produced. Manure is never of the same quality. The moment it begins to ferment, no matter how it is kept, it gives off a portion of its substance (ammonia) in a gaseous form, but this gas may be largely prevented from escaping by the use of absorbents, dry earth, water, or acids. The fermentation of manure in the soil is both chemical and mechanical in its action on the soil itself. It tends to decompose the insoluble matter, being a disintegrating agent by reason of the fact that the decomposition of manure in the soil induces and hastens chemical reactions of the insoluble substances.

Can you get cow or pig manure? If you can, then do so by all means. Both are splendid fertilisers for a flower garden, there being little heat in either of them, there is no fear of harm being done when they are being dug into the soil between growing plants. No manure—let it be cow or pig, horse or sheep or fowl—should be dug into the soil in a fresh state. It is better to stack it in some protected place, and only use it after it has been in the heap some months. Many gardeners have their manure arranged in three heaps. The fresh manure is placed in one; this, after a month, is turned on to heap No. 2, where it is allowed to lie two or three months, and is then turned on to No. 3—the heap from which it is used.

SHEEP MANURE.

The manure from sheep is worth more than that derived from any other animal; next that from the hog, and then from the horse, manure from cattle being less valuable than that from other animals. But in quantity produced cattle come first, then horses, next hogs, with sheep last. The value of manure does not depend altogether upon the animal producing it, however, as the character of the food consumed largely influences the manure, and even the manure from the same animal varies in quality and quantity daily.

Sheep manure, which is particularly rich in nitrogen, is rather difficult to get, and consequently expensive, but should you have a chance of getting a load at a reasonable price (say, 6s. or 7s.), seize it, especially if you are a carnation grower. This manure is one of the very best for the dianthus tribe, and at this season may be used by covering the surface of the bed to the depth of 1 inch, and lightly forking it in.

FOWL MANURE.

The excrements of fowls, and with them may be included pigeons, ducks, and geese, do not form a rich manure, and are not to be compared for fertilising value to the genuine Peruvian guano derived from birds living on fish.

According to Dr. Aikman, fowl excrements yield from 0·8 to 2 per cent. of nitrogen, ½ to 2 per cent. of phosphoric acid, and less than 1 per cent. of potash.

The quality is very variable. According to a series of recent analyses it may contain from—

5	to	20	per cent. of	sand,
50	,,	75	,,	water,
15	,,	25	,,	organic matter,
0·6	,,	4	,,	nitrogen,
0·5	,,	2½	,,	phosphoric acid,
0·5	,,	1	,,	potash.

A fowl produces about 12 lb. in a year.

As a means of preservation and preparation of the manure, it is a good plan to spread on the heap a little gypsum, or, better still, kainit, as the latter, besides helping to retain the ammonia, furnishes a proportion of potash; and if a little superphosphate is also added, the mixture would form a useful complete manure of a mild nitrogenous character.

Fowl droppings are a very valuable manure, but, owing to its heat, must be used with caution, especially amongst young and tender things. Its value is considerably increased by being dried in the sun, after which it is best stored in large boxes and kept in a dry place. Nowadays, almost everyone keeps a few fowls, and by careful collecting and storing of their manure an appreciable increase in the profit accruing from them may be made. This is not sufficiently recognised by poultry-keepers.

STABLE MANURE.

Stable manure should be kept long enough in the heap to enable all straw to become rotted, unless the soil be of a heavy clayey sort, when it would be benefited by digging it in quite fresh. A layer 3 inches thick spread over the surface and turned under would not be too much in such ground.

Of chemical and artificial manures suitable for the flower garden, may be mentioned (*a*) sulphate of ammonia; (*b*) superphosphate; (*c*) basic slag or Thomas's phosphate.

The first of these—sulphate of ammonia—is a powerful nitrogenous manure, and can be applied to the beds during the early autumn or spring, at the rate of 1 lb. of the manure to 20 square yards. Before sowing it, break up all lumps small enough to pass through an ⅛-inch mesh sieve. Sow thinly and evenly, carefully avoiding letting any fall upon the foliage of plants, as they are likely to be burnt by it.

SULPHATE OF AMMONIA

makes a splendid liquid manure for cinerarias, pelargoniums, &c. A tablespoonful in a gallon of water is quite strong enough. It is better to err on the side of giving it too weak than that of giving it too strong.

LIQUID MANURE.

In giving liquid manure of any kind, there are two rules that must be kept in mind—(1) Only give it to healthy, growing plants; (2) Water first with clear water.

SUPERPHOSPHATE

may be applied at the same time as the sulphate of ammonia, the two being thoroughly mixed and sown together; 4 lb. of superphosphate and 1 lb. of sulphate of ammonia on 20 square yards of surface is a safe quantity to use.

FOR ROSES.

This fertiliser is a splendid one for rose beds. Basic slag or Thomas's phosphate will be of small value unless broken and ground very small. When preparing new gardens, digging holes for trees, shrubs, or roses, renovating borders, a sprinkling of basic slag on the lower spit does good.

A USEFUL SILO.

Mr. J. D. Bond, of Belle Park, Eumundi, has just completed the erection and filling of a 60-ton silo, which he thinks is the first of its kind in Queensland. It was built in strict accordance with the plans and specifications published by Dr. Cherry, Director of Agriculture in Victoria, in the "Journal of Agriculture" of that State, a few months ago. Its dimensions are:—Internal diameter, 13 feet; height to top of wall, 21 feet. The frame is constructed of 4 by 2 hardwood studs bound firmly in position by hoops of 6 by ½-inch hardwood, bolted on to them. The lining consists of 24-gauge galvanised iron, 36 inches by 6 feet, fastened to the insides of the studs with galvanised clouts, and well tarred before being placed in position. The whole of the interior is painted with ruberine paint. There are three portholes fitted with doors through which the ensilage is to be taken out as required. The total cost of the structure is something under £30, including materials, labour, and freight; but, being made of the very best materials, it is reasonable to expect it to last at least twenty years. This style of silo should commend itself to farmers, on account of the extreme simplicity of its construction—any ordinarily intelligent man should have no difficulty in making a job. Our silo is built over-ground, but we expect next year to increase its capacity by excavating 8 or 10 feet. The silo has been

filled with maize and sorghum, by means of a No. 11 Ohio ensilage-cutter, driven by a small Hornsby oil engine, and a 24-feet elevator, which latter we made ourselves. After allowing the ensilage to settle, we covered the top with a layer of chaffed green grass, and weighted it by means of a layer of stones laid on bags.

SMUT OF WHEAT AND BARLEY.

Until quite recently it was generally accepted by scientific investigators that the only stage at which cereals were liable to infection by the diseases known as smut (*Ustilago*) and bunt (*Tilletia*) was during the youngest seedling state, and all work in combating or preventing these diseases has been based upon this assumption. About ten years ago, however, Mr. Frank Maddox, Pathologist to the Tasmanian Department of Agriculture, stated in some papers on his investigation into loose smut of wheat, that he had been successful in artificially infecting the wheat plant with the disease through the flowers. This discovery appears to have received but little attention, but scientists in Europe have been working for years along a similar line of investigation, and it is now announced that a German investigator, Ludwig Hecke, has demonstrated that barley is subject to floral infection by one of the smuts (*Ustilago hordei*), while another German mycologist, Professor Brofeld, a recognised authority on these fungi, has, it is stated, arrived at similar results.

It follows that in future two distinct modes of infection have to be taken into consideration in dealing with "smut" disease in cereals:—1. Infection of the seedling by "smut" spores present in the soil. This method of infection is combated successfully by the well-known method of treating the "seed" with formalin or other fungicide just before sowing. 2. Infection by "smut" spores carried by wind alighting on the ear of corn during the flowering stage. Plants that have been infected during the seedling stage can often be recognised by an expert by their more robust growth and darker green colour, the presence of the fungus in their tissues stimulating the plant to more active growth. As a result, such diseased plants are often taller than non-infected ones, and mature somewhat earlier, the "smut" spores being ripe and dispersed just at the time when uninfected plants are in flower. No practical method suggests itself for the prevention of infection through the flowers.

Farmers have frequently noticed that while under ordinary conditions the whole of the head of a "smutty" plant is destroyed by the disease, it not infrequently happens that heads are found to contain sound grain on one side and smut on the other, or the top half of the head only is "smutty." There has never been any satisfactory explanation for these phenomena, but now, with the general acceptation of the theory of floral infection, it can be easily accounted for. This discovery does not in any way lessen the necessity for preventive action in respect to the treatment of seed, as it is evident that the less infection from the seed the less the possibility of floral infection.—Exchange.

THE AUSTRALIAN TOBACCO CROP.

The crop of tobacco, 1905-6, in New South Wales and Queensland totalled 1,050 tons, of which 550 tons were produced in Queensland, in Texas and Inglewood districts.

The Texas crop was above the average, both in quantity and quality, and the same applies to the Tamworth and Manila crops. The Bathurst crop was a poor one, and Tumut suffered both from dry weather and an early frost. Ashford is a new district, and one that promises well. As regards the growing crop, it is too early to predict, with any degree of certainty, what it will be like. The weather was too cool in the spring, and that kept the young plants back, so that the crop is a late one.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 30TH APRIL, 1906.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Lass ...	Ayrshire	15 Mar., 1906	941	3·9	41·10	
Mona ...	Holstein Sh'rth'rn	16 Jan. ,,	943	3·4	35·91	
Blank ...	Jersey Ayrshire	17 Dec., 1905	697	4·5	35·13	
Poppie ...	Guernsey Jersey	11 Feb., 1906	679	4·6	34·98	
Magpie ...	Holstein Sh'rth'rn	4 Feb. ,,	940	3·1	32·64	
Hettie ...	Ayrshire ,,	28 Jan. ,,	616	4·5	31·05	
College Lass	,, ...	27 Feb. ,,	670	3·8	28·52	With first calf
Lavinia ...	,, ...	14 Dec., 1905	670	3·8	28·52	
Cocoa ...	Jersey	9 Oct. ,,	516	4·8	27·74	
Carrie ...	,, ...	13 Nov. ,,	503	4·9	27·60	
Chocolate ...	Shorthorn ...	27 Oct. ,,	646	3·8	27·49	
Grace ...	South Coast ...	10 Nov. ,,	567	4·2	26·67	
Beatrice ...	Jersey	22 Jan., 1906	469	5·0	26·26	
Ruth ...	Ayrshire... ...	20 Mar. ,,	668	3·5	26·19	
Rhoda ...	Grade Shorthorn	13 Oct., 1905	582	4·0	26·07	
Gin ...	Shorthorn ...	26 Jan., 1906	636	3·6	25·64	With first calf
Laura ...	Ayrshire... ...	2 Jan. ,,	703	3·2	25·20	

THE EFFECTS OF DISHORNING.

DOES IT INJURE THE BULL?

The "Rural New Yorker" submitted the following questions to a number of breeders of pure cattle. We reprint from this journal a few of the replies received:—

Have you known (1) of any cases where dishorning has apparently injured a bull for breeding purposes? and (2) Would you advise removing horns from a mature animal?

We have dishorned bulls of different ages, and in one instance only did we notice any bad effect. This one, a three-year-old, seemed very much depressed and very inactive for some little time, but soon came around all right and as good as ever.—E. H. Knapp and Son.

I do not dishorn my bulls, consequently do not have experience. I have always understood, however, that where the bulls were dishorned that they were not so good for breeding until they recovered from the temporary set-back given them by the dishorning process, but that after the stumps were fully healed they were equally as good as they were before they were dishorned.—W. W. Cheney.

I do not think that dishorning a bull should have any effect on his breeding qualities after sufficient time to recover from the shock. On an aged bull with heavy horns, whose vitality may be from other causes somewhat weakened, it might have a weakening effect until complete recovery. After the operation the bull should have good feed and good care and light use until well, when there should be no bad effects.—J. W. Martin.

My experience in dishorning bulls has always been favourable. If I raise them from calves, I kill the horn when about one week old with caustic potash. I shave off the hair just where the horn starts; one very light application ends

the growth of the horn. I have also had two two-year-old bulls dishorned. In each case it has done no injury to them, either as to their fertility or activeness, and the calves have grown well and were lively.—G. W. Higgins.

I have never had any such experience. Naturally, a sufficient time must be allowed for the animal to recover from the shock which inevitably accompanies the operation, but when recovered, none of the animals so treated in my herd have been in the least affected. For a time the dishorned animals are exceedingly docile, and naturally very tender about the head. This condition lasts for months in the case of a well-grown animal, but is of shorter duration with younger stock. I have never known a case of injury for breeding purposes by dishorning a bull or a cow. Many noted Holstein-Friesian bulls have been dishorned, and no suggestion has ever reached me that they were injured for breeding purposes thereby. So far as I have been able to obtain information on this subject, dishorning usually renders a bull less dangerous to handle, and for this reason I would advise dishorning mature bulls that show any signs of being dangerous, especially such as are kept solely for breeding purposes and not for show.—S. Hoxie.

I would say that on the average, not more than two months will see practically complete recovery from the shock of the operation, though the tenderness remains a much longer time. As a cure for an increasingly ugly disposition nothing seems to be better.—F. R. Hazard.

I have never dishorned any animal yet. I am in favour of having cows dishorned, as they run more peaceably together, and seem to get along much better than with horns. I have two service bulls, one has horns and the other was dishorned before I got him. I do not think it has ever hurt him for service in the least, but I think I would never have a valuable service bull dishorned unless as a last resort if he were very ugly. I have heard of cases where bulls were dishorned, and were not as vigorous as before, but this may be on account of age or they may not have been active generally. I prefer to see the horns on, as I think they look much better than off, and should always leave them on a valuable service bull so as not to take any risk.—A. A. Cortelyou.

Another correspondent of the same journal writes on this subject:—

I saw on page 113 several short articles in regard to dishorning a bull, and I feel that none of the writers touched the subject with sufficient strength. I have been a breeder of fine cattle for over twenty years, and have had bulls on the place during the time without fear of harm, although the bulls were not dishorned, until four years ago. While acting as judge at a fair, I met a man whose father had been killed a short time before by a bull with horns, and he spoke with such feeling on the subject that since then I have not had a bull over two years old that was not dishorned. To this man I owe my life, as I was attacked last spring and seriously injured by a dishorned bull, and a gentle one at that, and one that has not offered to attack anyone since. It was done in a spirit of play, while he was out for water and exercise, and in an unguarded moment on my part, and had he had horns I would not possibly have escaped death. It is in the hope of warning some other man as I was warned that I write the above. It matters not what the value of the animal is, or how beautiful his horns may be, human life is far too precious and bulls' horns far too common to take any risks. I have never seen the slightest ill-effect from dishorning our bulls. Have used them for breeding in a few days after the operation, and they have been as sure and as active as previously.

"CREAMERY" AND "FACTORY" BUTTER.

What is "Creamery Butter?" And what is "Factory?" These are questions which are fairly troubling the minds of dairymen—and, in fact, everyone connected with the creamery industry in this country at the present moment. The recent prosecutions have rather accentuated the feeling. It is

safe to assume, however, that we are within measureable distance of the solution of this vexed question. It is interesting to find the very great difference of opinion that exists on this matter, even amongst men whose views one would expect to be identical.

One of the foremost authorities in Ireland, on being interviewed on the subject quite recently, gave it as his opinion that "all butter made from centrifugally separated cream is creamery." "Would you," it was asked, "consider that the blending of two or more creameries together could be regarded as making the mixture factory?" "Certainly not," he replied, in the most emphatic manner.

On the other hand, there are a number who hold that the blending of creameries in any shape or form is in itself suspicious. Those who hold this view contend that the fact of a creamery requiring blending, or reworking, shows that there is something wrong. But that "something wrong" cannot transform it into a "factory." The opinion generally held in Ireland is that once butter produced from "set cream" is mixed with creamery—no matter how small the proportion—the lot becomes factory. Readers of "The Dairy," however, are likely to hear a good deal more about the matter in the near future.—"The Dairy."

COMMON ADULTERATION OF MILK.

The specific gravity of normal cow's milk is calculated to range between 1·029 and 1·033. As the specific gravity remains almost constant, it is possible to tell if milk is adulterated, also the form of adulteration practised. The addition of water to milk causes a low specific gravity, and the addition of skim milk a high specific gravity; very rich milk has naturally a low specific gravity, but the excessive amount of fat present is sufficient guarantee of its quality. What is needed to prove the common adulteration of milk—*i.e.*, the addition of milk or water—is abnormally high or low specific gravity combined with an insufficient amount of fat. It must be borne in mind that the addition of preservative to milk increases the specific gravity, also that temperature affects the lactometer reading. All lactometers work best at the temperature at which they are standardised, which is usually 60 degrees Fahr. If, however, the specific gravity of milk is to be taken at a lower or higher temperature, an addition or reduction must be made. For every degree of temperature above 60 degrees Fahr add 0·1 to the lactometer reading (heat expands milk), for every degree of density below 60 degrees Fahr. deduct 0·1 from the lactometer reading. Milk should never be tested for at least three hours after milking on account of the gases it contains when fresh.—"The Dairy."

SIMPLE METHOD OF TESTING MILK.

A simple way of discovering if milk is up to standard, when scientific tests are not available, is to weigh 1 gallon of milk on a reliable balance, and to deduct the weight of the vessel. If the milk weighs 10¼ lb.—that is, ¼ lb. more than the same quantity of water—the milk may be accepted as containing the solid matter required. The specific gravity of good milk is calculated at 1·033, which corresponds in weight to an increase of about 3½ oz. on 1 gallon of milk at 60 degrees Fahr., compared with the weight of 1 gallon of water at the same temperature. Of course, it is more satisfactory to have milk tested scientifically, but if this cannot be done, an approximate idea of the value of milk may be obtained in the way described, if a fat test from the same sample of milk is also made. Of course, it must be remembered that if anyone desires to calculate the amount of butter it is possible to make from a given quantity of milk without the aid of scientific appliances, accuracy will depend on

temperature and promptitude. To gain some idea of the fat content of any sample of milk: Take an even sample of milk immediately after milking, set it from 4 to 6 inches deep in a dairy which registers 48 to 50 degrees, and let it stand undisturbed for thirty-six or forty-eight hours. Skim the milk, ripen the cream, and churn it. A separator should be used for separating the cream from the milk when possible, as this test is valueless unless the dairy registers 50 degrees below new milk heat. It is necessary to know the exact amount of milk used with this test, as 10 gallons must produce at least 3 lb. of butter, or the milk may be considered below standard.—"The Dairy."

DAIRYING ON COSTLY LAND.

Why is dairying in Holland prosperous in spite of her high-priced lands, high taxes, and other high costs of production? (asks a farmer in the "New York Farmer"). The milk cows of Holland average 4,227 quarts of milk per head per year, on a conservative estimate. There is the one plain fact that underlies the most successful dairy practice on earth. The Hollanders have for centuries bred cows for milk. They have bred big cows. They have fed and housed them scientifically. They desired milk to drink, to sell, and to churn. They have as the result of their work those two famous breeds of cows known as the Dutch Belted and Holstein-Friesian.

They keep these cows bred up and fed up to a standard that means an average yearly production of 4,227 quarts, or over 9,000 lb., of milk per head. That is to say, the Holland farmers on their £100 to £400 an acre dairy land milk cows that surpass the "show" cows of the American experiment stations and the millionaire farmers of other countries.

Are these Holland cows high-priced cows? Authorities estimate that the 960,000 milk cows in Holland are worth £10,050,000. That is an average of £11 10s. per head.

Suppose American dairying were put upon a level with Holland dairying, what part would the price of land play in influencing the cost of milk production?

It requires about 17,000,000 milch cows to produce the milk of the United States, and the average yearly yield per cow is about 1,300 quarts. With cows of the Holland type yielding 4,227 quarts per cow, our 17,000,000 cows could be cut down to 5,300,000 cows, and that would mean a sufficient saving in investment, in feed, in shelter, in labour, and other cost of elements to make the dairying interest the most profitable farm interest in the world. The position of the Australian dairy farmer as regards the average annual production of milk per cow per annum is somewhere about the same level as the American farmer. With better cows and better treatment of them our average butter yield per cow could be easily increased by at least 50 per cent.

PRIZE FOR A RUBBER PLANTATION.

The Government of Brazil has decreed a prize of 30,000 dollars (£2,125) for anyone who exhibits 100,000 Maniçoba rubber-trees (*Hancornia speciosa*) within eighteen months from December, the date of the announcement; and three other prizes of 15,000 dollars (£1,062), 10,000 dollars (£708), and 5,000 dollars (£354), respectively, for the three next largest plantations, the smallest of which, in order to gain a prize, must not be of less than 10,000 trees. It appears that, not to speak of the value of the rubber, the coffee trees benefit greatly by the shade afforded by the rubber trees.—"West India Committee Circular," 19th January, 1906.

Poultry.

RAISING TURKEYS.

To the inexperienced person who is contemplating the raising of turkeys for the first time, a few remarks as to general conditions required for best success and a little insight concerning their habits may not come amiss. The farmer who would like to try them as a sideline need not hesitate because of the lack of houses, or, indeed, any accommodation other than the farm itself. A few boards, 14 or 18 inches wide, placed edgewise to form a pen of at least 8 by 12 feet in dimensions or more—the larger the better—a rudely constructed shelter in one corner, and if the spring weather be very wet, another wide board placed on the ground in the sheltered corner for the mother hen to sit on when hovering over her brood. This is the only outfit absolutely necessary to successfully care for the chicks.

As to needing a house when the poults are strong enough to use their wings, they would willingly roost on its roof, but never inside unless driven in and the door shut tight. You should not begin with more than two or, at the most, three hens; then when you are able to raise at least 80 per cent. of their hatch, it will be time enough to think of adding permanent conveniences. After you become proficient, you will experience no trouble in raising 90 to 95 per cent. of all chicks hatched. One must grow up with this business as with any other. I am reminded of a neighbour woman (says a writer in an exchange) who, removing from town to their newly-acquired farm, undertook that summer to care for the hatch of twelve hens. I foresaw the end, and advised her as best I could, but she was very enthusiastic, and worked early and late with them. But the final result of the whole season's work was an increase of an average of three-quarters of a turkey per hen.

Often in the late summer and fall visitors call here to see what they pronounce "a sight—so many turkeys in one flock"—and will occasionally say that they do not see why everybody does not try to raise large flocks; that 150 or 200 should be no more trouble to raise than fifty. To all who think this I have only to say: Make the experiment once, and you will then know more than I can possibly tell on paper. The trouble seems to be that so many make the mistake of confusing turkey-growing with the chicken business, when really it is very different. While chickens often thrive to a certain extent under very unhealthy conditions, turkeys, on the other hand, while apparently very hardy, soon succumb if far removed from conditions naturally favourable to them. For this reason they should not be kept for long at a time in small pens, nor be compelled to roost in close houses, nor be fed on filthy ground.

To make a comparison that most farmers will understand, turkeys, for the greater part of the year, should be treated as nearly as possible like sheep. And here let me say that if at times I seem to say that turkey-raising is light, pleasant work, suited to the strength of women, and, again, that it is arduous labour fit to command the attention of men, it is not that I am inconsistent, for the keeping of a pen is child's play to the care and work required for a large number. But whether one grows few or many, the profit in them is well worth the time and attention bestowed. The wider the range the less trouble they will prove. No one should try to raise turkeys unless they can command at least a few acres of pasturage for them at home. It is not quite honest to raise them year after year on one's neighbour's farm.

Where the average farm is large, and the range practically unlimited, the turkey may indeed be allowed to hunt its entire living until cold weather; but on a 50 to 100 acre farm, if it is not bounded with a turkey-tight fence, one must feed them bountifully and regularly to keep them where they belong; for a turkey, unless better trained, always want to be on the other side of the fence. You are not told this as a discouragement, but as a warning not to neglect the training of them at the proper time, for they can be readily trained to stay within proper limits, also to always stray in a certain direction. And it is still easier to teach them to come home to roost. To succeed in this, one must begin with them while the birds are young.

Some folks consider turkeys such senseless creatures, but this is because they have never studied them closely. On the contrary, I consider turkeys the most intelligent of all fowls. A number of hens kept through the laying and brooding season will present to the careful observer so many different phases of temperament—if I may be pardoned for the use of the term in such connection—as to be positively astonishing. And these same characteristic habits of the pullet will abide with her as a hen to such extent that by this means one may be able to easily distinguish certain hens from others of the flock.

This applies only during the breeding season, however, for as soon as they choose to consider themselves relieved of all their responsibility for the season they soon become apparently possessed of only ordinary turkey sense until the time comes that will once again call for the putting forth of their best efforts. We might almost deduct a moral from this peculiarity of the turkey.

It is this: That just so soon as we cease putting forth our very best endeavour, at that moment do our faculties begin to rust. By an infinite law we perforce advance or fall back. Life is resistless change. And we would best keep step in the march. As one cannot depend upon the mother turkey to bring her little ones home because of her instinctive caution, one must strive to gain the confidence of the poults. This is best done by giving abundant food—always reserving their favourite dish for supper—keeping up your custom of sometimes allowing them to fight among one another for the privilege of eating from your hand as you did for amusement when they were younger. Always treat them with uniform kindness and gentleness, and teach them to know the sound of your voice; and from the time they are ten or twelve weeks' old, the most careful old mother in turkeydom will find herself unable to keep them from hunting you up about sundown. When that time comes you will not need to be reminded of your duty toward them; on the contrary, if a woman, you may find yourself in danger of becoming too fond of them.

Growing up far removed from farm life, when I began living on the farm I was naturally much interested in all the farm stock, and especially the poultry, and although the turkeys were queer-looking strangers—so strange, in fact, that when, one never-to-be-forgotten day, I discovered a funny speckled egg in a chicken hen's nest, I got laughed at because I could not tell what kind of a fowl produced it, being the first turkey egg I had ever seen. Nevertheless I joyfully welcomed all the queer downy-striped chicks that seemed to be all necks and legs. Dear me! what fine poultry they were, and what a pleasure it was to care for them that summer. But when market time came, and they had to go the way of all fowl flesh, I felt—well, to put it mildly, I felt much as a bachelor girl would be expected to feel if required to give up her cats.

Even the substantial sum I received for them failed to quite make me forget. I might add that after various bereavements I learned in time to do as most farm folk—to not make pets of every animal and chicken on the farm. To spare your feelings you should only have two pets, your driver and the dog.—"Journal of Agriculture, W.A."

The Orchard.

STRAWBERRY-PLANTING.

Strawberries may be planted in the Southern districts from April to August. They should be planted 18 inches apart in rows 2 feet apart. The roots must not be cramped together in a little hole, but spread out laterally and the earth pressed firmly upon them. Garden land for strawberries should be deeply dug, and well manured with vegetable manure and ashes. In field cultivation, the ground, after ploughing, should be thoroughly harrowed and pulverised as deep as the plough has reached. The strawberry usually does best on comparatively new land, or land lately cleared, as there will be a quantity of humus or decayed leaf mould on the surface, which will be serviceable as plant food. The plant accommodates itself to almost any soil and locality, but low, frosty ground should not be chosen as the early and late frosts will kill the blossom, or give rise to the production of small unsaleable berries. Gravelly soil with an admixture of loam or clay will often produce good crops for two or three seasons. The whole of the soil should be lightly strewn with hay, straw, dry leaves, or cut grass when the plants begin to fruit. Water is a necessity for the strawberry plant; the field should, therefore, be located where irrigation is possible.

PREVENTING THE DECAY OF RIPE FRUIT.

In the January issue of the Journal, we published a suggestion by a prominent citrus-grower, near Brisbane, that a solution of formalin would be effective in preserving fruit for a sufficient length of time to enable it to reach distant markets in a perfectly fresh state. From the "Natal Agricultural Journal," 23rd March, we learn that trial of the process has been made which resulted in utter failure. The results are as follow:—"A quantity of President Schlachter strawberries was treated with formalin at Cedara Orchard, as prescribed, and stored in a cool place along with another lot which had not been so treated. Another similar lot of treated and untreated strawberries were sent by rail to Maritzburg, and kept till they decayed. In each case the treated berries looked worst at first, and least marketable, while there was practically no difference in their time of decay.

A further trial with the same variety was arranged, on which Mr. Anderson, orchardist at Cedara, reports as follows:—

STRAWBERRY—DIPPED.			STRAWBERRY—UNDIPPED.		
1906.	a.m.			a.m.	
31 Jan.	11 30	Fruit picked	31 Jan.	11 30	Fruit picked
	p.m.				
31 ,,	2 0	Fruit dipped		p.m.	
31 ,,	5 0	Appear two days old	31 ,,	5 0	Fresh
	a.m.			a.m.	
1 Feb.	9 0	Bloom gone; dark and soft	1 Feb.	9 0	Fresh
	p.m.				
1 ,,	5 0	Ditto ditto			
	a.m.				
2 ,,	9 0	Black and soft; unsaleable	2 ,,	9 0	A few started to mould
3 ,,	9 0	Ditto ditto	3 ,,	9 0	One-half mouldy
4 ,,	9 0	A few started to mould	4 ,,	9 0	Two-thirds mouldy
5 ,,	9 0	Two-thirds mouldy	5 ,,	9 0	A few still fresh
6 ,,	9 0	All decayed	6 ,,	9 0	All decayed

From this it appears that though the presence of mould does not begin quite so early, still there is a damaged and more or less unsaleable appearance on the dipped fruits from the time they are dried, and that there are fresh berries present among the undipped longer than among those dipped.

After about thirty-six hours the natural flavour is gone in both cases, and is replaced by a sour flavour; and up till that time the undipped berries look the fresher, so it is not evident that any advantage is obtained in dipping strawberries.

Mr. Anderson says if each fruit was dipped as it was pulled, and dried separately, that the damaged appearance would not show so much, as it is the parts which have had the pressure by contact which blacken most, and disfigure the berry; but, allowing that were practicable on a commercial scale, I fail to see what advantage could accrue from keeping off mould after the flavour has changed.

Strawberries carefully picked and packed, especially if packed in single layers, and kept cool, do not mould within thirty-six hours, which is enough for most practical purposes.

The treatment has not been tried yet on other fruits except Cape gooseberries (Physalis); with which both dipped and undipped berries pulled on 31st January kept fresh till 5th February, when signs of mould began, and by 7th February both were unsaleable. With this fruit the appearance was not changed by dipping.

It is to be hoped the formalin process does more good in other kinds than in these.

Apiculture.

NEW VARIETY OF BEES.

The United States Department of Agriculture is importing bees of a new kind, which come from the Black and Caspian Seas in Russia. It is intended to breed from these, and eventually to distribute them to beekeepers. They are said to be the gentlest and most good-natured bees known. An American paper, "The Saturday Evening Post," writes of them:—

"These bees are excellent honey-getters and prolific breeders, but their most important recommendation is their amiability of disposition. So mild is their temper that they can hardly be induced to sting anybody, even though they be stirred up, shaken about in the hive, and subjected to other maltreatment such as would drive ordinary bees to fury. In handling them it is not necessary to wear either gloves or a bee veil, and the smoke ordinarily employed by the bee-master when engaged in manipulating comb frames, &c., may be entirely dispensed with.

"The Caucasian bees will be bred in a model apiary which is being established at the Arlington Experimental Farm, across the Potomac from Washington. This will be a breeding station for various types of bees. Queens, as well as workers, of Italian, Cyprian, Dalmatian, and Carniolan races will be imported for breeding; and also, probably, bees of Oriental tribes—particularly the so-called giant bees, one species of which is found in the Philippines. These giant bees have very long tongues, and are able to gather nectar from flowers which have corolas so deep that ordinary bees get only a small part of the sweets."

[We should think that bees whose gentle nature restrains them from retaliating when annoyed would not resent the intrusion of "robber" bees, in which case we should prefer to deal with those that require to be manipulated under the protection of bee veils and smoke.—Ed. "Q.A.J."]

Tropical Industries.

RAMIE—ITS CULTIVATION AND PREPARATION.

There can be no doubt that if ramie fibre could be produced as easily as sisal fibre, a very paying industry would present itself to Queensland planters. The plant grows to perfection in this State on almost any soil except on that which is very wet or on stiff clay. It is very easily raised from cuttings and from roots. It grows equally well under partial shade and in the full sunshine. The stems grow very rapidly and well under favourable circumstances, attain a height of 8 feet; but such a height is undesirable. The fibre is at its best when the stems run to 4 or 5 feet. There is a good market for all the fibre that can be produced, at very remunerative prices. Why, in the face of these advantages, do we find no attempt made to grow ramie in Queensland?

The whole matter hinges upon two factors—hand labour and machinery.

HAND LABOUR.

To ensure an even sample, it is necessary that each stick should be cut separately, for if the whole plant be cut, mature and immature fibre, coarse and extremely fine, will be mixed, with the result that a reduced price is obtained for the raw material. When the sticks are cut, the next process is to remove the bark from them, as, in all bast fibres, the latter is contained in the bark. When the stems are cut, the bark is stripped off by hand, then it is slightly scraped with a blunt knife, and hung up to dry. Thus are produced what are called "ribbons." These ribbons are packed into bales, and have a regular market value.

PRODUCTION AND COST.

An acre will produce 15 tons of stalks. This would cost about £4 per ton of ribbon. In Selangor it was shown that a crop of stems was ready for cutting in three months after planting, and a plentiful supply coming on, one-fifth of which would be ready for harvesting six weeks later. A trial was made of a given number of stems taken haphazard from a heap. It was found that the mean of 15 stems weighed 4·8 oz. each, but, call it 4 oz. Taking the cuttings as having been put in at 18 inches apart, there would be 8 plants to the square yard, or 38,720 to the acre. Assuming that each plant only produces 3 stems in three months, and calculating these at 4 oz. each, we arrive at 13 tons per acre, and inasmuch as the stems renew themselves every six weeks, this will give an aggregate of 78 tons of stems per acre per annum. Three hundredweight of stems are cut per day. A coolie, therefore, from 2 acres of land, will have to cut 6 cwt. Taking the day at ten hours, this means that he will have to cut three stems a minute, and bale and deliver them every hour to the tramlines, where they will be picked up and delivered to the decorticators.

Taking two coolies to the acre, and the wages at 9 dollars per month (1 dollar equals 2s. 1d.), the cost per annum is 43·40 dollars per acre, or per ton of ungathered ribbon 58·45 dollars. Considering that at least 15 tons of stalks have to be treated per acre, not less than 20 dollars could be allowed per ton of ribbon. This would bring up the cost of the ribbon to 78·45 dollars per ton, or 57·98 dollars per acre. The least that can be allowed for supervision, manure, buildings, rent or interest on cost of land, fencing, &c., is 10 dollars per acre, which would bring the final cost of the ribbon to 91·97 dollars per ton, or 67·98 dollars per acre.

Now, Sir Daniel Morris, when director of Kew Gardens in 1896, gave the price of ribbons as £8 per ton in London. It does not appear that more

than £7 (67·20 dollars) per ton could be reckoned on, and, as by the above estimate, it would cost to grow and prepare the ribbons 91·97 dollars per ton, it would appear that there is a loss of 4·77 dollars per ton, or 18·30 dollars for each acre of cultivation.

On the other hand, estimates made on estates in Java show a profit of from £12 per acre in the first year to £50 in the second (!) from a cultivation which, so far as we know, no one has yet tried on a scale sufficiently large to justify reliable estimates for a plantation, at any rate, in the Eastern World. Garden estimates are useful as a guide, but they do not count for serious estimates on a big scale with experienced tropical planters. In Jamaica, where ramie has been tried on a small scale, the yield per acre is said to be about 40 tons of green fibre, worth, say £20. The cost of cultivation is from £5 to £10 per acre for the first year (a big margin), and after that, for cutting and manuring, about £9. Thus there is a profit of about £11 per acre when in full growth.

But here again we are confronted with difficulties—

(a) Does this cutting include decorticating?

(b) What is the weight of dry, marketable ribbons, as compared with the green ribbons?

We are told by Mr. James Anderson (an expert in ramie fibre), in a letter he wrote to the "Agricultural Bulletin" of the Straits Settlements: "The idea of a trade of any dimensons ever springing up in raw ribbon may be abandoned, as these lose in removing the bark and gum 40 per cent., and in baling must occupy two-thirds more space than the clean article would do. . . All that is needed to make ramie the huge success that it will, and deserves, to be, is the knowledge amongst growers of how to remove the ribbon from the stem in quantity without hand labour, and after this is done, to be able to get rid of the outer brown gum and bark cheaply and effectively."

Has this been done? Yes, it has. Why then is the information as to how to do it so difficult to arrive at? Because those who could make it plain to the grower will not do so, as few care to give away for nothing knowledge gained by expense as well as by time and trouble.

Again, Mr. Anderson says:—

"Contrary to the recognised theory I have conclusively proved to my own satisfaction that it is one of the least difficult of fibres to prepare for manufacturing purposes, and that the returns from dry stems grown in suitable localities such as the Straits Settlements far surpass those obtained from flax or hemp, with both of which I am intimately familiar, were ramie put to the same ordinary use as flax. The waste after being degummed would scarcely be a half of that in flax. I notice that there is a difficulty in connection with the cutting of the ribbon from the stems, and that a machine that will accomplish this at the rate of half a ton a day is needed. There are such machines in use now, employed for other purposes, through which I have passed stems grown in the Botanic Gardens of Glasgow with far more wood than fibre on them, and nearly as solid as a walking cane. These came out without a particle of wood adhering to the ribbon. The machine that I used I am sure would deliver not less than a ton of clean ribbon a day. With a simple machine that can be got here for about £2, two men could easily remove not less than 200 lb. a day of fibre from dry stems. Any patent machine driven by steam needing the attention of two men and only turning out, say, 1 cwt. a day, is a costly farce.

"In conclusion, allow me to say that no patent machine is needed for the preparation of the fibre, and that the process of degumming it cannot be protected. It might be kept a secret, but that is all, as I know of half a dozen ways of doing this, all of which are equally cheap and effective. When the so-called expert, whose ignorance of fibre and its treatment is amply demonstrated by the absurd and costly method he employs, disappears, and the mechanical efforts of the patentee are found in the scrap heap, then, and

not till then, will ramie, rhea, or China grass get the chance that it has been denied. When this comes to pass, it will revolutionise the industrial affairs of the Empire, and bring untold wealth to Eastern climes.

The Cause of the Ramie Difficulty.

That difficulties still confront the planter must be known to all who have the least knowledge of the relative qualities of other economic fibres that are prepared for manufacturing purposes either by hand or machine. The cause of the whole ramie difficulty rests here, and has not been overcome, as Mr. Radclyffe makes out. Until this is solved, ramie will make little headway; for the best power-driven machine, requiring the attention of two men, can only produce about 50 lb. of ribbon a day, and is at the same time very wasteful of fibre. To expect either capitalists, planters, or manufacturers to interest themselves under these conditions is absurd.

Neither is it the easy thing that Mr. Radclyffe supposes for manufacturers to introduce special machinery for the purpose of working what fibre can be got. It is safe to say that no manufacturer would be so foolish. Any that have done so have had occasion to regret their action. It is not a question of specially designed machinery, as this is not required at all.

Proper Preparation of the Fibre Wanted.

What is really needed is the preparation of the fibre to suit existing conditions. This I have done, and got it spun over the ordinary flax and tow machinery in use here. The result was so satisfactory that the fibre merchant who supplied the ribbon wanted to buy the spun produce in the form of rove and different ply twines. To further prove the ability of ramie to meet the conditions that prevail in the flax trade, I carefully weighed some of it last week, and hand dressed it the same as I do flax, with the result that I had a yield of long fibre equal, to 70 lb. per cwt., fit to make a very fine size of yarn. Any flax that can give that yield is considered exceptionally good.

To Planters.

Planters who can and will grow ramie need have no fear of getting quit of their produce at prices that will pay them handsomely, but they must have a different machine to any that is in the market for the purpose of removing the ribbon from the stem of the plant, and until this can be had planters will not grow ramie, as they have other crops that grow and pay in good land such as ramie needs. I know the plant from the stem to the highest finish of its produce, and could, by means that I have tested time and again, remove the ribbon from the stem at the rate of 1 ton a day by one machine attended by three men. In the preparation of the ribbon after its removal to suit any purpose for which it is intended, I find no difficulty whatever, and I would rather prepare ramie than flax in any shape or form. But I am fully prepared, in order to show you what ramie should be, to send you samples of my work prepared to take the place of the finest of flax that is used in the making of the highest class of thread and the finest of linen napery.

The Use and Value of Green Ramie Stems

depends entirely on their treatment, and if by certain instruments or machines the bark, woody matter, and cuticle can be removed without damaging the fibre, and the liquid gum pressed out, strips of fibre will be obtained divided in numerous filaments, and free from a great portion of the useless elements. Care must be taken, however, that the beating and scraping be not too violent or the fibre will be injured.

In order to prevent the hardening of the remaining gummy matter, some authorities recommend that the strips should be placed in a chemical bath, immediately after being taken from the machine. Other authorities would soak the green stems first, or subject them to the action of a certain

gas, then dry and work them mechanically. This preliminary treatment by liquids or gas would change the gummy matter to a powder, and when the stems were afterwards well dried, decortication would be easy by means of beaters or stripping machinery.

These operations refer to the green stems, which do not require to reach maturity in order to provide good fibre, and, taking everything into consideration, are much easier to treat than the dried ones. The fibres are of a superior quality, and one may cut four times the number of crops—which point is of vast economical importance in warm climates where the stems reach a height of about 5 feet in thirty-five to forty days, when well watered by regular rain, or irrigated.

The Weight and Value of the Crops.

The results of the crops vary according to the locality, the number of cuttings per annum, the system of treatment, and the skill of the labourers, which makes it impossible to fix a general standard revenue per acre. In taking the gross weight of the yield per acre of green or dried stems, we only obtain a very approximate estimate of the initial value of the crop, as the quantity of useful fibre is not in proportion. The weight of the green stems is generally taken by the purchaser as a basis for his calculations, but this is subject to great variations, and often a great loss of vegetable liquid takes place in an incredibly short time, when the atmosphere is dry. Then the stems have more or less leaves, and are more or less compact, according to the season, which causes the weight to vary. In fact, some stems grown in the summer have been found of inferior weight to those grown in the spring, though of the same dimensions. In a carefully cultivated hectare ($2\frac{1}{2}$ acres) we find from thirty to forty stems per square yard, about 64 inches high, which means 400,000 stems per hectare each crop. The average weight of free fibres is about 3 to $3\frac{1}{2}$ grammes per stem, or 1,200 kilos (one kilo equals 2 1-5th lb.) for 400,000 stems, and for four crops per annum 4,800 kilos of "filasse" (fibres not quite completely degummed). Supposing, in round numbers, a yield of 4,000 kilos of degummed fibre per hectare, the sum realised at the present price of 850 fr. per ton would be 3,400 fr. (£135, or £45 per acre). It is impossible to estimate the exact profit to the grower on account of the varying conditions of productions in different localities, but an average minimum of £10 per acre may be counted on, and though the first cost of planting is considerable, the maintenance of the plantation is very simple and inexpensive. To estimate the value of the crop by the gross weight of the stems often leads to serious discrepancies. Though 400,000 green stems weigh, as a rule, 18 to 22 tons, they lose rapidly in weight by evaporation and falling of leaves, and sometimes the same number of stems only weigh 15 to 18 tons, though containing no less weight of fibre than the heavier ones. This depends on the season, the quantity of moisture they hold, and the number of leaves."

Ramie Machines.

Many machines have been invented with the object of cheapening and expediting the decortication of the stems of the ramie plant and degumming the ribbons. How many of these have fulfilled expectations? As far back as 1892, trials of machines were made at New Orleans of several machines, with the result, as the report issued by the United States Department of Agriculture showed, that these trials do not appear to have carried us any nearer to the solution of the problem of the extraction of ramie fibre; indeed, the machines appear to have been inferior to those tried at Paris in 1888, 1889, and 1891.

At the New Orleans trials, three machines were entered—viz., the Kauffman machine, the Felix Fremerey Decorticator, the Fibre Deliquating machine, known as the J. J. Green machine.

The Kauffman Machine.—This machine requires a 15 h.p., engine; it works on green stalks stripped of leaves, and also upon dried stalks. Four attendants are required to run it; floor space occupied, 6 ft. by 14 feet. Five hundreds pounds of green stalks were weighed out for the test. Of this amount 332 lb. were run through in 42 minutes, when the machine clogged. The result in wet ribbons was 88 lb., and 168 lb. of stalks remained unworked, owing to the inability of the machine to proceed further.

The J. J. Green machine was next tried, 500 lb. of green stripped ramie stalks having been weighed out for the test. Of this quantity 225 lb. had been deliquated in 1 hour 35 minutes, producing 57½ lb. of wet ribbons, and 275 lb. of stalks had to be left unworked, as the machine could proceed no further.

The Fremerey Machine.—Mr. Fremerey declined the trial, as he claimed that the 500 lb. of stalks were too uneven in size, the construction of his machine requiring medium stalks.

In a review of the results of these trials, Mr. Charles Richard Dodge, special agent in charge of fibre investigation, reported as follow:—

"While the figures for the day's work, based on the results of short running, are wholly misleading, it is interesting to note that the output of the Kauffman machine, during the 42 minutes of continuous work before it clogged, represents 4,743 lb. of green stalks in 10 hours of continuous action, or a little over 2 tons, with an output of 1,257 lb. of wet ribbons, equal to about 420 lb. of dry ribbons, which weight would be considerably reduced after the loose hurds and woody matter remaining in the ribbons produced by this machine had been eliminated.

"In like manner, were the J. J. Green machine to run continuously for 10 hours, turning out ribbons at the speed shown when in actual operation—that is, deducting the 67 minutes spent in cleaning and readjustment—the output would have shown a capacity of 4,821 lb. of stalks and 1,232 of dry ribbons. But, as shown, both machines were unable to finish the 500 lb. of stalks weighed out for each trial."

Two French machines were tried, it is said, successfully, at Paris in 1888. They were the Favier and the Bilion, but neither of these was ever offered for sale, as the proprietors preferred to establish factories near the plantations and purchase the stalks for manipulation. Another machine was invented at Barcelona by Don Demetrio Prieto, the inventor of the highly successful sisal fibre extracting machine in Mexico.

The Faure machine is said to be as well adapted for decorticating ramie stalks as for extracting sisal fibre. An improvement on this machine has been made by Mr. Max Rowl, and this was introduced into New South Wales by the Department of Agriculture of that State, where it was worked on the Wollongbar State Farm.

There is no doubt a big future for this ramie industry, particularly since the establishment of weaving works in Ireland by Mrs. Hart, who has quite solved the problem of weaving the inelastic fibre into the most exquisite patterns. But we are still in the dark about machinery for decorticating and degumming, and as hand labour in the Australasian States is out of the question, ramie-growing will be long before it is taken up as enthusiastically as is now the case of sisal fibre.

"Commercial Intelligence" says on the subject of the uses of ramie:—"So much has been published in our columns concerning the new fibre ramie that many of our readers will be interested to learn that the difficulty of weaving the fine yarns has been overcome, and cloths suitable for all purposes are now being made. Aside from cloths, very fine ramie underwear is made, which is being eagerly sought by the shippers for foreign countries and the States. The fibre is extraordinarily durable, and therefore suitable for hard wear. For ladies' dresses some beautiful cloths are offered, and so well does the material lend itself to the dyer that the most subtle blending of shades or the most vivid colours come out equally well on the cloths. As our readers

are aware, the triumph of the British weaver in this instance is the triumph of that remarkably talented lady, Mrs. Hart. Unfortunately, Mrs. Hart, though perfectly willing to show the journalistic visitor all her beautiful specimens of ramie goods, is not inclined to be communicative when the said visitor presses for details as to methods. We ourselves came away impressed, but distinctly uninformed, if the lady will pardon us for so saying."

DETERMINATION OF SUCROSE.

In a letter to the Imperial Commissioner of Agriculture, the Hon. Francis Watts, C.M.G., D.Sc., states that the paper on the "Polarimetric Determination of Sucrose" by himself and Mr. Tempany, published in the "West Indian Bulletin" (Vol. VI., p. 52), was reprinted in the "International Sugar Journal" for August last. Dr. Watts draws attention to the fact that it has given rise to interesting papers and criticisms in the issues of the latter journal for September, November, and December, and that, in the January issue, the editor gives a *resumé* of the whole position.

In his paper, Dr. Watts reviews the various methods in use for determining the percentage of sucrose in solution, and points out the many errors likely to enter into the calculations, and the ways in which these errors may be eliminated. In conclusion, Dr. Watts recommends the following method of working as generally applicable:—

(1) Use a weight of 26 grammes of the sample of sugar, dissolve in distilled water and make up to 100 true cubic centimetres.

(2) Clarify by means of anhydrous basic lead acetate, avoiding excess.

(3) Polarise at the temperature at which the solution is prepared and correct for temperature by the formula, Polarisation +* (·00038 t) N, where t is the difference between the temperature of observation and that at which the instrument was standardised, and N is the Ventzke scale reading.

Working in this manner will, it is believed, secure a high degree of accuracy, and at the same time uniformity between those working under diverse climatic conditions. This method is, therefore, commended to the careful consideration of those responsible for securing uniform methods of sugar analysis, whether for official or technical purposes.—"Agricultural News," Barbados.

THE FIBRE MARKET.

The "Journal d'Agriculture Tropicale," which devotes a special portion of the journal to the fibre markets, and publishes the latest reliable price lists, writing on Manila hemp in its issue of March, 1906, says:—

"It appears more and more convincing that the production of Manila (Abaca) fibre, which attained its apogee two years ago, in the shape of 1,000,000 bales, or, say, 125,000 tons exported, is, for as yet undefined reasons, continually on the decrease. This state of affairs, which is certainly disquieting, should incite planters to undertake the planting of this fibre-producing plant everywhere where it is economically possible to do so, as the actual prices for the fibre are very remunerative.

This month the market is very firm; little is offering, as sellers are holding back, hoping for higher prices next month. We quote: Fair current, prompt arrival, £42 14s. 6d. to £43 11s. 1d.; good saleable second grade, £41 9s. 7d.; good brown, for May-June shipment, £37 6s. 8d. per ton. The above will account largely for the firm tone of the market for sisal fibre, which is ruled by that for Manila hemp.

Mauritius hemp (*Fourcroya gigantea*), is also firm at high prices, say, £32 to £35, and sisal £38 to £40.

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* If the temperature is below that of standardisation, the correction will be − instead of +.

THE SOYA, OR SOY BEAN.

This bean is a native of China and Japan, whence it has found its way to India, Ceylon, and the shores of the Mediterranean. In its native country it is used as an article of food. H. F. Macmillan, in an article on the bean, printed in the "Ceylon Tropical Agriculturist" says:—It is prepared for use chiefly in the form of a sauce, paste, or cheese, the latter two preparations being made by crushing and pressing the seeds. In India, the seeds are said to be cooked and used in various ways, often roasted and ground as *satu*, or simply eaten in the form of *dal*. Soya sauce is said to form the basis of many popular sauces made in Europe. It is prepared by the Chinese and Japanese by boiling the beans with an equal quantity of roughly-ground barley or wheat, and leaving it covered for twenty-four hours to fermet; salt is then added, water is poured over, and the whole is stirred at least once daily for two or three months, when the liquid is poured and squeezed off, filtered, and preserved in wooden vessels, becoming clearer and improving in quality by long keeping. I am unable to say at present what the commercial value (if any) of this article is, outside its native country; but a few years ago it has been recorded to have been then worth about 2s. 6d. per gallon. The seeds contain a large quantity of oil, yielding, it is stated, about 17 per cent., by simple pressure. This oil, which possesses an agreeable flavour and odour, is also extensively used for food in China and Japan, and to some extent for burning and other purposes. The residual cake left after the expression of the oil from the seed is a nutritious cattle food, and is also eaten by the poorer classes, as well as used as a manure. Personally, I think Soya Bean as a vegetable is very agreeable, and forms a good substtiute for the lentils and broadbeans of Europe, if cooked and served similarly. Its chemical composition, according to Professor Church, places it above all other pulses as an albuminous food.

As a fodder plant, too, the Soya Bean is said to be of considerable value, a statement I am not ready to confirm unless the crop is cut in a green condition before the fruit ripens, and prepared rather as hay. The residual cake referred to above is obviously a most nutritious cattle food, for, quoting Professor Church again, it contains 40 per cent. of flesh-forming materials. The erect habit of the plant would be a point in its favour for reaping and harvesting as a hay crop. It does not, however, in its present form grow to sufficient height to be recommended for cultivation solely as a fodder crop, though with high cultivation and a process of selecting only the best seeds from the best plants for sowing purposes, it might be greatly improved in this and other respects.

In these days of green-manuring, any plant that is at all adapted to this mode of cultivation deserves consideration. The Soya Bean would appear to me as being to some extent suited to the purpose and worthy of a trial, for even if it should fail as a green-manure crop, it might serve a useful purpose as an article of food for man or beast. The writer, upon his advice being sought, has lately suggested this plant for trial as a green manure and as a catch-crop, recommending seeds to be obtained from Japan for the purpose.*

Regarding cultivation, probably few crops are less exacting in their requirements than this. Its most striking characteristic, judging by results recorded at Peradeniya, is the remarkably short space of time in which the plants grow and produce a crop. Here the seeds germinate in three to five days, the plants flower when a month old; a fortnight later the pods are fit for picking, and the harvesting is complete in about two months from the time of sowing. Thus, granted the seasons were favourable, it should be possible to obtain four crops a year. In making these statements, which may seem unduly optimistic, it is not by any means intended to convey the impression that practically no expenditure of labour is involved in the production of this crop. On the contrary, it is

* Since writing this, Mr. Kelway Bamber has presented a small quantity of Soya Bean seed to the Botanic Gardens, remarking that he intended to recommend it as a green-manure crop.—Ed. "T.A."

pretty certain that to make it a profitable product for whatever purpose, even under the most favourable conditions for its growth, a reasonable amount of cultivation will be required. It has yet to be proved how far it would repay cultivation in Ceylon for fodder and green manuring, but that it should prove a welcome adjunct to the food products of the natives, if not as a general vegetable, there seems no question.

The seeds may be sown thinly in shallow rows, about 18 inches apart, the ground being previously well-forked or dug to a depth of 6 or 7 inches. Needless to say, the commencement of a wet season should be taken advantage of for sowing the crop. The hard seeds will keep for a long period if stored in stoppered bottles or jars, care being taken that they are first well dried.

NEGLECTED INDUSTRIES.

CHILLIES.

Large quantities of capsicums and chillies are imported in European States from Africa, and good prices are always obtainable for these spices. East African chillies sell readily at from 30s. 6d. for mixed yellow, and bright red at 37s. per cwt. Japan chillies bring 43s. Bright yellow African capsicums—"cherries"—sell at 55s., and bright red at 57s. In Queensland chillies and capsicums are not cultivated as a field crop. Most people grow a few bushes in their gardens, but nowhere are they grown for export. They are sold in the Sydney markets at from 3s. 6d. to 4s. 6d. per bushel, in a ripe state. In the Southern, Central, and Northern districts of this State, and even all over the State, they grow like weeds, and bear very heavily. Would it not be possible to produce them commercially? Picking chillies is as easy as picking coffee or cotton, but it must be remembered that the European market price is for dried chillies, and it takes a considerable weight of green fruit to make 1 cwt. of dried. A very instructive article on chillie cultivation appeared in the "Ceylon Tropical Agriculturist" of June, 1905, and we take the following notes from that article:—

"A large sum of money is expended every year in importing chillies into Ceylon, and it is a matter for surprise that the cultivation of a food crop, the produce of which is used in every native household, should not be freely taken up in the island. What cultivation exists is on a comparatively limited scale.

Chillies are used in native cookery in two forms: (1) as fresh chillies (both "green" and "ripe"), the demand for which is entirely met by local cultivation; (2) as "dry chillies," which, with the exception of a comparatively small quantity, are all imported from India.

That there is no serious obstacle to the preparation of dry chillies for the market has been proved by those who have grown them as a "catch crop" in permanent cultivation—such as cacao—and found a good market for them in London.

We are, however, not here concerned with cultivation and preparation for export by large landowners, but with the growing of chillies for the local market by small cultivators.

In this connection some interesting information is furnished by Mr. Alfred Jayawardene, Mudaliyar of the West Giruwa pattu, where the cultivation has been extended largely as the result of the encouragement given by the Assistant Government Agent of Hambantota (Mr. A. C. Allnutt).

[Mudaliyar Jayawardene reports that since the beginning of this year over 600 acres are being cultivated with chillies in his pattu. The seeds, when broadcasted, produce about 15,000, and when planted from nurseries, about 6,000 plants per acre. The cultivation generally begins in April, and picking commences from June, and continues off and on for five or six months. With proper attention, a chillie plant lives for a year. The produce per tree may be said to vary from 10 to 20 and upwards per picking, and two or more pickings

can be got per month, according to the fertility of the soil. The price on the land varies from 10 to 15 cents per 1,000; in the market it is about 30 cents. The above figures apply to fresh chillies. The chief difficulty in the extension of the local trade in dry chillies is the fact that they do not keep as well as the imported article, and this is probably due to bad "curing."]

The "curing" of chillies only consists of drying them. The fact of locally-dried chillies soon going bad must, therefore, be attributed to insufficient drying and bad storing.

The ripe capsules should be thoroughly dried in the sun, either on rocks (where they occur) or on mats. When sufficiently dry, they should be sewn up as tightly as possible in coarse sacking, in bundles of 4 to 5 bushels, and stored in a dry place. They should not be kept longer than necessary in this condition before being sent to the market.

For continued cultivation the land should either be manured or the crop rotated with other crops.

To begin with, the land should be worked up well to a depth of from 4 to 6 inches, and brought into a fine tilth. If the soil be poor, it should be manured with cattle dung *during the preparation of the land*, so that the manure will have become thoroughly decayed and mingled with the soil at the time of planting. Later on a dressing of ashes may be given with advantage.

Broadcasting should be abandoned, and the plants grown in rows, to admit of proper weeding and after-cultivation.

When well established, the plants should be earthed up, a mound of earth being formed round each plant.

In India, when the plant begins to flag, as a result of continuous picking, a top-dressing of castor-cake (600 to 1,000 lb. per acre) is given to prolong the cropping season.

In Ceylon, the favourite manure consists of the leaves of *Croton lacciferum* (keppitiya), and there is a strong prejudice against cattle manure.

The chillie plant is sensitive to applications of fresh cattle dung, which has a tendency to force it into leaf; the leaves are found to become abnormally large and curly, and the plant asumes a generally unhealthy appearance.

Manuring with cattle dung, when necessary, must, therefore, be done *early* and during the preparation of the land. The practice among our cultivators is to *manure the plant*, and not the soil; and when they directly apply manure that has not undergone proper fermentation, they induce a condition which many plants—and especially the chillie—cannot tolerate.

In Ceylon, mixed cultivation is the common practice, chillies being grown together with betel or other crops.

In India, chillies, when grown as a separate crop, are rotated with ground nuts, gram, &c., and there is no reason why ground nuts and chillies should not be grown in rotation by local cultivators.

Zanzibar is well-known as a chillie-producing country. An official report, referring to the industry there, mentions that "the cultivation is easily carried on, and calls for no special trouble or skill. and the returns are certain and profitable . . . the pods are picked when ripe, sun dried, and packed in mat bags." This extract suffices to show that there is nothing special to learn about the "curing" of chillies.

Good cultivation—with resulting large crops—is the main point, and if the chillies have to be dried they should be dried thoroughly to ensure their keeping qualities. But with present prices for fresh chillies, cultivators will prefer to sell their produce undried, unless they are forced to dry for the want of a convenient market.

In Colombo the ordinary market price of fresh chillies may be put down at 12 cents per 100, and of dry chillies imported 15 cents per lb. (averaging, say, 750 chillies).

GINSENG.

Some three years ago there was much inquiry in various parts of this State about ginseng, a medicinal root possessing, according to Chinese ideas, so many virtues that it is sold at its weight in gold. Ginseng of good quality generally occurs in hard, rather brittle, translucent pieces, about the size of the little finger, and varying in length from 2 to 4 inches. In price it ranges from 6 or 12 dollars to the enormous sum of 300 to 400 dollars per oz.—that is to say, from £1 4s. or £2 8s. to £60 or £80 per oz. (when manufactured, presumably). One would naturally think that such prices would tempt anyone to plant a few square yards of the tuber; yet it is only in the United States that we hear of enormous profits being realised by some persons by raising ginseng. The demand always exceeds the supply. Probably the length of time the grower has to wait to obtain the largest roots, which extends to seven years, may have something to do with the disinclination to enter upon its cultivation. The wild root dried is worth from 18s. to £1 15s. per lb., and the cultivated roots sell at much higher prices. A farmer in New Mexico (U.S.A.) estimated 35,000 dollars (£7,000) as the return for roots alone on 1 acre of ginseng, five years old, and the yearly seed crop at a large sum in addition.

In the June issue of this Journal we published an authenticated account of the returns of the ginseng garden started in 1897 by Messrs. E. D. and M. S. Cresley, at Tulu, New York State. Their first planting of 500 roots was a failure, but next year they planted a few thousand wild roots, and also raised 10,000 plants from wild seed. In 1901 their profits from a ½-acre garden reached 5,000 dollars (£1,000). The total outlay to obtain this result was £11 15s. 5d. for seed and labour. The "Indian Agriculturist" last year (1905) published the following article on the subject:—

Ginseng, the celebrated Chinese medicine, is the root of the *Panax ginseng*, a herbaceous annual with a perennial root, of the natural order *Araliaceæ*. It is a native of the evergreen forests of the Central Asian plateaus, China, Korea, and Japan. With a delicate stem scarcely a foot in height, that bears at its summit a tuft of light-green leaves and scarlet berries, the plant is almost inconspicuous, and is rare even in the regions of its natural habitat. Throughout the limits of the ethnographic distribution of the Mongolian race, its tonic and stimulant properties have been sufficiently recognised and appreciated to merit its being regarded as the foremost among Oriental drugs, and as the most valuable medicine the world has either seen or produced! This remarkable faith in its efficacy is all the more remarkable when it is remembered that the most recent pronouncements of Occidental medical science, with its analytical mode and its electrical chemistry, still find nothing of virtue to extol in ginseng. To stimulate the young, to invigorate the feeble, to bring back to the wan check of the convalescent the ruddy glow of health and pristine beauty, to check the langour or to correct the lassitude consequent upon indulgence in powerful narcotics such as opium—these are some of the commoner uses to which ginseng in China has for centuries past been daily applied. But when it is claimed that, apart from its tonic and stimulant properties, habitual use rejuvenates the aged, prolongs life, and has been known to stay the hand of death itself for more or less appreciable periods of time, the wonder is that genuine ginseng only sells at its weight in silver and gold. The dried and clarified roots of the Korean or Mandarin ginseng frequently sell at 200 dollars the lb.; so that, whatever the merits of the drug as a medicine, or whatever its application in the internal economy of the Chinese household may be, its high commercial value as an economic product, said to be almost indispensable to the physical happiness and well-being of more than 400,000,000 members of the human race, must be regarded as possessing sufficient importance to merit our best consideration.

Although the current price of Korean ginseng is very high, the demand for the drug is so great that it is likely to rise higher. The growing scarcity

of the plant in its native wilds, coupled with the increasing demand for the drug, is tending to not only enhance its value wherever it is found, but has also recently had the effect of lending value to inferior products that resemble it. The real drug is cultivated in China, where it is so jealously guarded that it is restricted to the Imperial gardens and the palatial groves of the wealthy and privileged mandarins. Hence the name "Mandarin Ginseng."

Some years ago, another species of ginseng, the *Panax quinquefolium*, was discovered on the mountains of the eastern United States of America. The knowledge of the fact that the roots of the American species were, fortunately, held by Chinese physicians to be a worthy substitute for it decided the Americans to introduce the latter to the commerce of China. In time the prices realised by American ginseng in China rose so high, and such was the demand for the new drug there, that the trade not only brought in handsome profits, but it also created a special class of nomadic labour to exploit it. This community of "sang collectors" has, however, waged such reckless and incessent war against the plant that it has almost disappeared from its home in the mountains. But with their usual zeal and characteristic energy, with the prospect of ruin to an exclusive and luctrative trade before them, the Americans have quite recently attempted the cultivation of the plant in garden culture. Although it is a delicate species, it has already, under systematic culture, responded to treatment so completely as to be reckoned among the well-established crops of the Union. The care that has been devoted to its cultivation has been well repaid by the production of roots of even finer shape and larger size than those of its wild congener. This interesting fact will not, however, come as a surprise to economic botanists, to whom the study of the history of the commoner cultivated plants frequently reveals more remarkable truths. Our cereal crops, our luscious fruits and finest vegetables, and the fantastic and fragrant flowers that bloom in the grandest gardens of the civilised world have all descended from wild ancestors. They have been reclaimed from the cramped dwarfishness of indigent barbarism by patient, careful, and systematic culture, by hybridisation, grafting, and the like skilful arts, until at last they have evolved into the lovely priceless organisms of to-day. Our mealy potato, for instance, which artificial culture has raised to the unrivalled eminence of our most coveted tuber was, within recent times, nothing more than a "small, hard, knotty acrid ball, the size of a boy's marble."

Ginseng, then, though a plant that grows under the dense canopy of evergreen forests, is fast becoming, in all suitable localities, under proper culture, one of the foremost of the root crops of the world. In India and Ceylon, in the extensive wilds of Burmah and the Malay Peninsula, the best natural conditions ordinarily prevalent in all areas that spontaneously support evergreen forests, the mild and equable climate of the Malabar Coast, with its abundant rainfall, its warm sunshine, its gentle sea breezes, copious dew, and comparative freedom from frost, present many of the most favourable conditions for the installation and growth of evergreen forests. In the Tenasserim district, with its perennial humidity, evergreen forests are both extensive and luxuriant. In such localities the raising of ginseng would obviously present little difficulty. But in garden culture the case is different. Too much care cannot be bestowed upon the raising of such a delicate exotic. The following facts regarding the habits and requirements of the species, therefore, may be of use to would-be cultivators of the plant in Burmah:—

1st.—The seed, which matures in the autumn of each year, germinates only after eighteen or twenty months from sowing.

2nd.—The plant likes moisture and moderate shade, a well-drained, freely cultivated soil, and luxuriates in dark forest loam.

3rd.—After germination, its herbaceous stem each year attains to a height of 10 inches, and, after seeding, dies down at the approach of the cold weather; in the following spring it shoots up again. If permitted to remain

in the soil, the roots grow larger and thicker each year, and the plant is hard to kill after it is once established.

4th.—The longer the root is permitted to remain in the soil, the more valuable does it become; for instance, the product of a single acre of four-year-old ginseng, realised in the States last year 40,000 dollars. This value could not have been realised from a younger crop of equal extent. The quality then, in addition to the quantity, is materially enhanced by age. This feature, which few crops present, has the distinct advantage of permitting the crop, when prices are low, to remain in the soil and continue increasing in value until the market becomes favourable enough to sell it to advantage. Although ordinarily harvested between the fourth and sixth year of sowing, plantations of ten and even twelve year old ginseng are not uncommon in the States.

5th.—Ginseng lends itself to profitable culture on even small areas of land. It would pay to grow it on even a few square feet of ground. The plants require little space to grow in, so that they can be planted out close to one another. Many prosperous ginseng farmers in America are content with raising a single bed 16 feet long and 4 feet wide, such a bed often holding as many as a thousand plants. This interesting feature of the plant justly entitles it to the consideration of all those who, while possessing a taste or inclination for gardening, cannot do so from want of space at their disposal.

6th.—Once the crop is established, it requires very little care or attention. A bed 20 feet long and 4 feet wide, planted up with ginseng roots, or sown with seed 3 inches apart, both in and between the lines, would hold 1,280 plants. The seed is highly priced just now, and cultivable roots still more so. A thousand seeds sell at 10 dollars, and stratified roots are from 10 to 15 cents each. It would, therefore, be profitable to purchase seed. The cost of 1,280 seeds, at the price quoted, would be 12·8 dollars.

The method of cultivating the plant is as follows:—The bed should be carefully prepared with the hoe in a cool, shady spot in the garden, and the soil thoroughly worked up to a depth of 1 foot at least. All roots and stones should be removed, and the soil mixed up with about 50 per cent. of dark forest loam or vegetable mould, and a small quantity of bat's or icthymic guano. A light tatty of split bamboos should be erected on posts about 6 feet high over the bed, and a climber, such as the sweet potato, convolvulus, or *mucuna* trained so as to grow over the sides and top of the tatty. The bed should be prepared and the cover grown over it sufficiently in advance to admit of the seeds being sown directly they come to hand. Previous to sowing the seeds, the bed should be watered so as to keep it moist but not wet. The soil, too, should be occasionally stirred about and aerated. Care should be taken to so regulate the shade that no heavy drip falls on to the bed during the rains. It should also be light enough to admit an appreciable quantity of overhead sunlight. The seeds are small and hard, and should not be sown deeper than 1 inch below the surface of the bed. After sowing, the bed should always be kept moist, but not wet. On germination, each plant will be seen to consist of a succulent stem bearing three palmate leaves radiating from a common centre, the apex of the stem. During the autumn the plant gives out a small head of yellow flowers, which are succeeded by globose clusters of scarlet berries, each with a single seed. The seeds should now be collected and stored up for future sowing. When the seeds ripen the stalk turns yellow, and droops and dies down in a few days. Meantime, the roots will have developed from the delicate, thread-like filaments at first put out by the plant on germination into small tuberous roots which in shape resemble those of the sweet potato (*Ipomœa Batatas*), or common carrot (*Daucus carota*). In the first year, however, these roots are scarcely thicker than a quill, but with each succeeding year the root thickens, until in the fourth, when it is usually harvested, it averages 4 inches in length and 1 inch

in diameter. The most promising tubers of good shape are usually reserved for planting, but the rest are carefully dug up, washed, and dried *in the shade*. After this, they undergo a process of steaming and classification. In handling the roots, their skin should not be injured, particularly at their upper ends. When properly steamed they turn translucent, after which they are dried in the shade and stored away in silken bags packed side by side in a wooden box. Sometimes slaked lime is freely sprinkled over the sides and bottom of the box. Packing the bags between wads of cotton wool has been known to answer well enough for export purposes.

Two or three years ago the Department of Agriculture imported some ginseng from Japan. This was sent to the Kamerunga State Nursery, but whether the seed was bad before arrival, or from some other cause, although it was carefully sown in boxes and well looked after for eighteen months, none germinated. A further supply is being obtained, and if the seed is fresh, and germinates freely, it will not be long before seed will be available for distribution.

THE MICHIE-GOLLEDGE RUBBER EXTRACTING MACHINE AT WORK.

LABOUR AND FACTORY SPACE QUESTIONS.

A visit to any estate having old rubber is a liberal education. Not only does one feel respect for the pioneer who planted them—even though his faith was only the size of a seed—but also for the hoary veteran whose scars show him to be the hero of innumerable assaults on his cambium. In some cases so many are his scars that either the tree has to be pensioned off and excluded from the tapper's round, or his bumps continue to try the skill of the most expert tapper. But there he stands, an ugly beauty, looking for all the world as though his stem and lower branches were encased in plaited cocoanut leaves. And if he no longer contributes his life's blood in a good cause he continues at the age of twenty-five to prolifically produce "chips of the old block," which the superintendent sees are carefully gathered in. But the visitor finds most of the liberal education in the latest methods of tapping and of treatment of the latex. No longer are wedges hacked out of the trunks; and the young trees are developing under very different conditions. Patent knives and prickers save the bark, so that only a few inches will be removed under operations performed on alternate days during most of the months of the year; and, so thoroughly can the coolie be taught to spare the cambium, that the stem will remain nearly as symmetrical as in its natural state. Occasionally a coolie starts with the notion that the deeper he cuts the more milk he will extract; but that notion is short-lived, and is liable to leave his head in a hurry. No definity has yet been reached in the construction of tapping knives; and further improvements will come upon the market. And the same may be said of latex machines and other rubber factory facilities; but, after long promising himself the pleasure of seeing the Michie-Golledge machine at work in its inventor's factory, the writer was on Saturday able to do so. Six thousand tapable trees make a good large field from which to draw the material; and, realising how great is the saving of space effected by the machine and the accompanying system of cutting up the rubber into "worms," one comprehends not only the importance of the present achievement, but the possibilities yet undeveloped. It is unnecessary to dream of the future, however, for a practical demonstration of the working of the machine makes one enthusiastic over the rapidity with which the latex is coagulated. It has hitherto been termed a centrifugal machine; but it is centripetal in results, for, by means of fixed blades inside the revolving drum, the latex is driven into the centre, where the "sponge" of rubber is deposited. The latex on this occasion—strained as usual through a fine wire sieve, and provided with one dram of glacial acetic acid for each gallon of diluted latex, much of the acid being taken out again in the churning—was diluted with rather more water than usual; and 6 gallons of the "whitewash," weighing

52 lb., was placed in the drum, which was at once set in rapid motion. Experience has disclosed that there "is nothing like a good start," and consequently the coolies commenced to grind away at the full number of 180 revolutions to the minute, and slowed down later as directed by the man in charge. In six minutes the coagulation was completed, and the sponge, which was lifted out in handfuls, and was loaded with water, weighed 20 lb. It was then passed through two mangles, the first with lighter pressure than the second. Too much pressure with the first roller makes lace rubber, and too much pressure with the second closes the air cells and means less evenness of colour and loss of the opaque amber which are such marked features of the "worms." The two rollers squeezed out 50 per cent. of the water in the "sponge"; and it was at once ready to be cut up. The whole process of churning and rolling took fifteen minutes, and the white sheets weighed 8¼ lb. Another 50 per cent. would be lost in drying during the twenty-four hours following the cutting-up process, and then the finished article, having occupied little space in the process, is ready for "boxing"—or, it may be before long, baling. Apparently about 92 per cent. of liquid goes into the machine.

A great feature of this rapid treatment is that the tapping coolies can, by waiting fifteen minutes, be told how much rubber they have brought in; and they get their "name" on the spot. It is also intended, as the work develops, that the tappers shall cut up their own sheets; and this should not take them more than half an hour, for a test showed that three expert wielders of the shears cut up 24 lb. of sheet in an hour, which represents 4 lb. of dry rubber per coolie. The way in which the trained coolie, whether man, woman, or child, plies the shears leaves very little to be gained if the sheets were sliced up by another machine.

At present the tappers on Gikiyanakande are each bringing in latex enough for 1 lb. of dry rubber per day; and they are allowed to bring in the whole quantity before 11 a.m. if they choose. On Culloden, however, they are bringing in their 2 lb., going out both morning and afternoon; and thus it is that opinions vary as to the number of coolies per acre that will be ultimately required. Future necessity points to the larger quantity of rubber being collected per coolie. Mr. Golledge's system, however, is worth describing, agreeing, as it does, with the experience of others who expect that a mature rubber estate will require nearly three coolies per acre. Each coolie is given 160 trees, and taps eighty of them on alternate days. One or two podians standing in the factory were pointed out as having done their eighty trees that morning, brought in their bucket of latex, equal to 1 lb. of dry rubber, and finished their day's work! With trees planted 12 feet by 12 feet, or 300 trees to the acre, this would take very nearly two coolies per acre for tapping; and for weeding, gathering scrap, factory work, sickness, &c., another coolie for every 2 acres may be required. Exigencies of labour, however, may demand that coolies be given a larger number of trees, representing a day's task that cannot be finished by noon. If every three months half an acre were rested, while the trees on the other half were tapped on alternate days, it would follow that, with further improved appliances, one tapping coolie would have to suffice for an acre, representing, for everything, about three working coolies for every 2 acres. Already time and cups are being saved. Two cups, instead of sixteen or twenty, are used for matured trees, a cup at the base of each cut being no longer used. At the most now 80 to 160 cups are needed for a given number of trees for which previously 400 cups were wanted. The constant washing of cups is also found necessary.

The Michie-Golledge machine may not take out the proteids as the Malay States washing machine does; but undoubtedly it removes the organic and other foreign or impure matter, and shows in the finished article no less than from 93 to 97 per cent. of pure rubber. Analyses of the whey from biscuits and from the machined rubber show results in favour of the machine; but possibly it may be found necessary to use ammonia instead of acetic acid to keep the

proteids in liquid form during coagulation. Naturally-coagulated rubber has a bad smell. The machine-made rubber has not this drawback, and has never become tacky. Mr. Golledge has ordered a washing machine to deal with latex that has partly coagulated by the time it reaches the factory, and for all scrap, &c.; but he still intends to cut up the washed rubber into worms to save the space and time rolled sheets would require for drying.

The separator can deal with a large quantity of latex daily, but the inventors consider that additional machines should be got for distant fields to save transport of waste liquid, and to get even colour for the rubber. The machine has received many high testimonials, and the visiting agent of the estate, Mr. R. W. Harrison, has declared that the machine admits of quicker despatch than when any other form of curing is adopted, and that although a washing machine has been ordered, the superintendent will still be able to continue the "worm" system instead of turning the product out in sheet or crepe form. The cost of production at present works out at 53 cents per pound in the field, and 5·75 cents in the factory, or 58·75 cents per lb. in all; and the prices obtained continue to be of the best.—"Times of Ceylon."

SISAL FIBRE INDUSTRY.

An old Victorian, Mr. R. R. Mackenzie, now of the Chaudpore Tea Estate, Chittagong, India, writes on the subject of the sisal fibre industry. Some photographs of the plants (the *Agave rigida, var. sisalana*) are, we regret to say, not suitable for reproduction in our columns. Our correspondent is forming a sisal plantation, and he furnishes a few particulars respecting the cultivation of the plant. The plants grow to a height of nearly 6 feet, and they send up flower stems which average about 28 feet in height. These stems, called poles, will each produce from 4,000 to 5,000 bulbils. These are attached to the branches, are about 2 inches in length, and when ready for removal, are transferred to nursery beds until they are about 9 inches in height, when they are planted out in their permanent positions. They are planted 6 feet apart, in rows 8 feet apart. These distances afford ample space for cultivation and harvesting. A mature leaf weighs about 2 lb. 6 oz., and the percentage of dry fibre in the weight of leaf is about $4\frac{3}{4}$ per cent. The present value of sisal fibre ranges between £32 and £40 per ton, according to quality, represented by its colour and evenness. The yield of fibre is between 10 cwt. and 14 cwt. per acre per annum after the fourth year. When the plant flowers it dies.—"Australasian."

[Mature leaves of *Agave rigida, var. sisalana,* in Queensland, weigh about 4 lb., and yield from 5 to 6 per cent. of fibre. Leaves of the *Fourcroya gigantea,* or Mauritius hemp, attain here a length of from 6 to 8 feet, and yield a larger quantity of fibre than the true sisal; but, as the quality of the fibre is slightly inferior, it sells for from £2 to £3 less than sisal fibre.—Ed. "Q.A.J."]

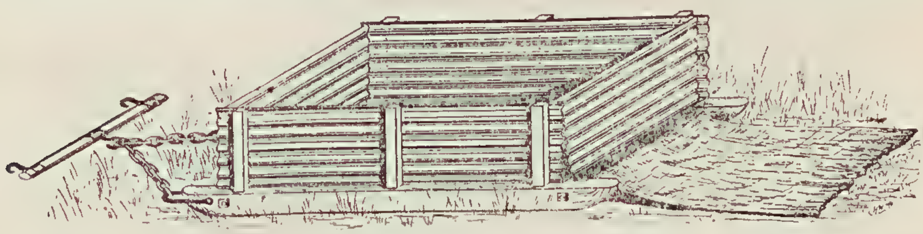
PAPER FROM SISAL POLE PITH.

We lately received a portion of the flower pole of the sisal plant from the Superintendent of the Penal Establishment at St. Helena, Mr. J. Ryan, who thinks that the fibrous pith could be utilised in paper-making. We were fortunate enough to be able to submit the material to a gentleman from Mackay, Mr. McHardie, who was connected with paper-mills for many years in the old country. His opinion was, that it would make splendid material for paper, but doubted if it could be obtained in large quantities. The clean fibre and tow, he said, would make excellent paper, indeed any fibrous material would enter into the composition of papers of various classes. He had seen stable

manure converted into brown paper of good texture. From inquiries he had made as to the requirements in the way of paper in this State, he came to the conclusion that there would be profitable work for five paper-mills here. A mill with a double set of machinery turning out 40 tons of paper a week would cost £60,000 to establish, yet, with all the raw material at hand, it would prove a paying speculation. Esparto grass, which grows well in Australia, especially in arid districts, would pay, he said, to grow for paper-making. It is worth from £7 to £10 per ton. It grows best near the sea, where it attains a height of from 6 to 10 feet. In harvesting, it is pulled from the roots—not cut, and the leaves part easily from the socket. We propose to write fully on this subject in our next issue.

A USEFUL DEVICE FOR SISAL PLANTERS.

The cultivation of the sisal aloe differs entirely from that adopted for any other crops, bananas, perhaps, excepted. In Mexico, Yucatan, Mauritius, and other countries where the production of sisal fibre is an established industry, the spaces between the rows are not cultivated, horse-hoed, or ploughed, as is done in the case of sugar-cane, maize, or cotton; in fact, such cultivation is a matter of impossibility, even if it were desirable, where the plant is grown in coral rock, generally destitute of soil. In such situations, thorny bushes spring up and coarse grass. These are usually cut down once or twice a year, to expose the plants to sun and air, but no turning up of soil is possible. But even were such working of the ground feasible, it would not always be advisable, more particularly in the present incipient state of the industry. All over the State small and large areas are being prepared for sisal planting, and the demand for plants far exceeds the supply. Those who have been early in the field, and whose plants are now throwing out suckers, will be enabled to sell them at a good price. It would then be very inadvisable to destroy them by cultivation. On the other hand, during the late wet season, grass has grown luxuriantly all over the sisal fields, and the problem how to get rid of it, before the bush-fire season arrives, is an important one. Our illustration, as suggested by Mr. Dan.



Jones, of this Department, shows how the desired end may be attained with perfect safety to the plants. A light sledge of bush timber is constructed with galvanised-iron sides, about 3 feet high. This sledge is drawn between the rows of plants, and, as it is almost of the same width of the row, and about 8 feet long, the grass which it encloses can be fired. As soon as one patch has burnt out, the sledge is drawn 8 feet further, and the enclosed grass fired, and so on to the end of the row. As the rows are at right angles, and the plants all equi-distant, the sledge can next work across the field. Thus the whole of the grass can be destroyed, and all danger from bush fires is averted. A couple of bags trailing behind suffice to extinguish any lingering flame. It may be asked how the suckers escape destruction. The succulent leaves of the plants are able to resist a small transient fire, and even when they are scorched, they soon recover. Last season a roaring bush fire swept through a plantation at Broadwater, Logan district. About 3 acres of twelve-months' old plants were scorched and turned white, but did not shrivel. They recovered in a remarkable manner, and the difference between them and the untouched plants is rather in favour of the scorched ones in point of size and symmetry.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

ELEVENTH LESSON.

SOIL.—MECHANICAL AND CHEMICAL ANALYSIS. PHYSICAL AND CHEMICAL PROPERTIES. REACTIONS OCCURRING IN SOIL.

Soil serves to nourish plants by supplying them with all the necessary mineral or inorganic food and with a small amount of organic food. A **chemical analysis** will show if the necessary inorganic plant foods are present in the soil or not. If we should find an absolute absence of either potash, or lime, or phosphoric acid, we must at once consider the soil unfit for cultivation, unless the wanting constituents are supplied by the application of artificial manures. On the other hand, the presence of an abundance of mineral plant foods would not in all cases be a proof of a high fertility of a soil, because in the first place *injurious chemical* compounds may be present; secondly, the mineral matters may be in a *highly insoluble form*, so that they are almost inavailable as plant food; and, thirdly, the *physical condition* of the soil may be very poor, so as to make a healthy growth impossible.

The physical properties of a soil are of as much importance as the chemical composition, and some ideas on these properties are formed by the **mechanical analysis** of a soil, which is generally made with the complete chemical analysis. A complete chemical analysis can only be carried out by a trained analyst, where as many of the most characteristic physical properties may be determined by any one.

The fresh soil, when collected from different parts of a field to be sampled, is more or less damp and requires to be thoroughly dried in the air, but not in the sun. Large lumps are broken up by being crushed and rubbed between the hands. A weighed portion of the air-dry soil is now passed through sieves with meshes of various diameter, and is separated into groups of particles of certain size. The coarsest sieve with meshes of $\frac{1}{4}$-inch diameter (5 millimetre mesh) separates out the **stones.** A second sieve with a $\frac{1}{8}$-inch (2 to 3 millimetres) mesh will give the **gravel,** and a third sieve with $\frac{1}{25}$-inch (1 millimetre) mesh will retain the **sand.** The portion passing through the last sieve is called the **fine earth,** and is used for all further investigations. By weighing the different portions obtained, the percentage by weight may be calculated. The first three portions of coarse materials retained by the sieves may be called the **skeleton** of the soil. The *fine earth* may be further divided into various grades of fine particles by washing the soil in currents of water of different velocity, which process is called **elutriation** of soil. By this process we obtain various classes of **fine sand** and **clay,** which remains suspended in the washing water. A similar separation, although less perfect, may be obtained by taking a small quantity of the fine earth, about $\frac{1}{2}$ to 1 oz., boiling it with some water, in order to break up all the lumps and make a fine paste, then adding more water and filling a long glass tube or a long-necked bottle with the mixture. The cylinder or bottle is closed with a cork, shaken up well, and finally allowed to settle with the neck downwards. (Experiment 78.) The particles of sand will settle down in accordance with their size, and will form layers with the largest particles at the bottom, the finest sand on the top, and the clay in suspension in the water.

Both soil skeleton and fine earth have their separate and important functions. The *fine earth* being finely divided throughout the soil is more liable to further decay by weathering, and is more easily attacked and made soluble by the soil moisture. The fine earth is richest in the soluble mineral and organic plant foods, and is directly attacked by the fine rootlets of the growing plant. It gives the soil a greater *tenacity*, and allows the roots to get a firm hold in the soil. The fine earth has the most important function of *retaining* and *absorbing* the plant foods dissolved by the action of water, and prevents them being washed away into the subsoil, or to be lost altogether in the drainage water. It also absorbs gases from the atmosphere, and gives the soil the power to retain moisture and heat. The finely divided lime found in the fine earth helps in the decomposition of organic substances.

The *skeleton* of the soil allows *free access of air*, and thereby prevents unfavourable processes of putrefaction (mouldiness), which, in the absence of air, would cause acidity of soil and produce injurious compounds, like ferrous oxide and salts. The skeleton makes the soil more *pervious to water*, and prevents the water becoming stagnant in the soil. A further important function is its influence on the growth and *development of the root system* of a plant. Gravel and sand causes the development of a larger amount of small branch roots and rootlets, as compared with the growth of roots in water or very fine moist earth, which are longer, more fibrous, and less branched.

Weight of Soil.—By weighing the fine earth in a vessel, and comparing this weight with the weight of the same vessel full of water, the *apparent specific gravity* of the soil is obtained. From this apparent specific gravity the weight of the fine earth, per acre, to a depth of 6 inches, is easily calculated by multiplying by 607, this weight in tons is obtained. It will be found by weighing different soils (Experiment 79) that *light soils* which, as already explained, means easily worked soils, have a much higher weight than the so-called *heavy soils*. In one of the early numbers of this Journal (May, 1900), a complete list of the analyses of soils from our various State farms was published, and in this list we find, for instance, that a heavy, rich, black alluvial soil, which contained 80 per cent. of clay, weighed 777 tons per acre, whereas a sample of light, poor, sandy soil, with only 17 per cent. of clay, weighed 995 tons per acre. Soils rich in humus have, as a rule, a small apparent specific gravity, and we find in the same list a sample of red volcanic scrub soil, from Redland Bay, rich in humus, only weighing 709 tons per acre.

Capacity for Water.—This is a very important physical property of soil, as only with the help of water the valuable mineral constituents are made available to the plants, and a good soil must be able to store up water for future use. Soils rich in humus, and also clayey soils, have a much higher capacity for water than sandy soils, although the latter may be much more porous. This property is easily ascertained by saturating a weighed portion of the fine earth, which is placed on a filter, with water, and weighing the wet soil again after the water has stopped dropping through. The weight of a moist filter paper of the same size as the one used for the soil must, of course, be deducted from the total weight. (Experiment 80.)

Experiments carried out with different classes of soil and sand will show that pure sand will only retain about 25 per cent of its weight of water, whereas a sandy clay may absorb as much as 50 per cent., a good garden soil, fairly rich in humus, may absorb 80 to 85 per cent., and a peaty soil as much as 180 per cent. A light sandy soil from Gindie State Farm absorbed only 20·8 per cent. of water, the soil being able to retain to a depth of 6 inches only 199 tons of water per acre, whereas a heavy black soil from the same locality had a water capacity of 68 per cent., and absorbing 491 tons of water, although the soil in itself was much lighter, weighing only 722 tons against 959 tons of the first sample. The capacity for water depends on the fineness of the soil, as the finer the soil and the more numerous the minute

spaces between the soil particles, the higher will be the amount of water capable of being absorbed. The water capacity will, therefore, be increased by thorough tillage and by enriching the soil with humus, by the cultivation and ploughing under of green manure crops. The increase of humus is of particular importance; in some of the plots of the celebrated experimental fields at Rothamsted, wheat soil which was kept unmanured for twenty-six years had a water capacity of only 32, whereas the same land, regularly manured with farmyard manure, had a water capacity of 66. More particularly in our climate, with our heavy rainfall at long intervals so common in many localities, this property of a soil is of the greatest importance, and should not only be maintained but increased by careful deep cultivation and judicious manuring.

Capillarity of the soil is a physical property which aids in the circulation of water, and more particularly helps to supply the surface soil with water from the subsoil, and also prevents the water becoming stagnant. *Capillary attraction* is the power which causes water to rise above its level in fine tubes and minute fissures. The capillarity of a soil is easily ascertained by filling glass tubes of about ¾-inch to 1 inch diameter, and 18 inches to 2 feet long, with the fine earth, shaking the soil down fairly tight, after tying up the lower end with a piece of muslin. The filled tubes are placed into a shallow dish containing water. The water as it rises in the tubes is measured after certain intervals, as after 6, 12, 24, and 36 hours. (Experiment 81.) In a highly porous soil the water will rise in twenty-four hours about 1 foot. The capillarity does not go hand-in-hand with the capacity for water, and we may have a soil with a very high water capacity, but with a very poor capillarity. A very interesting and instructive instance is given by some samples of soil obtained from the Hermitage State Farm. A sample of soil from the so-called "*salt land*" patches, which are found occasionally in places in good agricultural land, had a water capacity of 62 per cent., and of 86 per cent. in the subsoil, but the capillarity was so exceptionally poor that after 60 hours' standing the water rose only ½-inch in the tubes, whereas in a soil from the same locality of the surrounding good agricultural land we find a water capacity of 50 per cent, and a capillarity of 13 inches rise in 36 hours. This case is doubly interesting, as the complete chemical analysis of the soil from the "salt patch," which refuses to grow anything, compares very favourably with the analysis of the good soil, and is fairly rich in potash, lime, and phosphoric acid, and even richer in nitrogen. The sterility of the soil is unquestionably due to the poor physical condition, which could be improved by thorough deep cultivation, and by draining the land.

The properties so far ascertained are the chief objects of mechanical analysis, but before proceeding with the study of the chemical changes and reactions occurring in the soil, I must mention another physical property, the **relation of soil to heat.** A small amount of heat will be produced in a soil by the chemical process of oxidation always going on, which in the case of heavy manuring with farmyard or with horse manure may amount to a rise of temperature of several degrees, but which, on the whole, is not appreciable. The chief source of heat in the soil is due to the rays of the sun, which will have more or less heating effect, varying with the locality and situation of the land. Dark-coloured soils will become much hotter than light-coloured soils. Again, a wet soil will not heat up so easily as a dry soil. The depth to which a soil is heated will depend on the conductivity of the soil; soil which is of loose texture and contains much air will not allow the heat to penetrate, whereas a gravelly and stony soil will cause a warming up right down to the subsoil. Warm soils are, as a rule, more favourable to plant growth, and more particularly so if the temperature between day and night does not show a great difference. Light-coloured and wet soils, although not so much heated up as darker soils, show a greater fluctuation of the soil temperature, and wet soils are particularly cold if the subsoil is very wet and badly drained.

Another property of soils, to be attributed partly to physical and partly to chemical causes, is the **absorptive power** for salts and gases. If we add to a good loamy soil a small quantity of water containing a little ammonia, we find that after a while the soil has absorbed all the ammonia (Experiment 82). Similarly, solutions containing small amounts of phosphoric acid, potash, and other salts, will be deprived of their salts by being brought in contact with a good fertile soil. This property is of the greatest importance to the agriculturist, as it prevents those soluble manures which are applied to soil being readily washed away by rain. Soils vary very considerably with regard to the absorption power; soils rich in humus have a better absorption than sandy soils, and the absorption again varies for different substances. For practical purposes it is generally sufficient to ascertain how much nitrogen is absorbed by a soil from solutions containing a known amount of ammonium chloride. In our soil analysis sheets we state how many cubic centimetres (16 cubic centimetres equal to 1 cubic inch) of nitrogen are absorbed per 100 grammes of soil. A good black volcanic soil from Gindie State Farm absorbed 300 c.c. of nitrogen, whereas some sandy soil from the same farm only absorbed 20 c.c. If we add a dilute solution of ferrous sulphate (green vitriol) to some rich garden loam, we will find that after standing a while and filtering off the clear liquid, this liquid will contain no more iron, but contains the sulphuric acid, but is still of neutral reaction (Experiment 83). We find that **absorbed by the soil** are:—

Potassium, in the form of its salts, is absorbed by hydrous silicate of lime, magnesia and iron of clayey soils; carbonate and hydroxide of potash are also absorbed by the humus and humic acid, and in a lesser degree by free silicic acid and hydroxides of iron and alumina.

Sodium salts are absorbed in a similar manner, though lesser degree, than potash salts.

Ammonia is also absorbed by hydrous silicates in a large degree by humus, also by basic iron and alumina salts, by hydrates of iron and alumina, and by phosphate of iron.

Phosphoric acid is absorbed and fixed by lime, magnesium, and iron salts, by basic silicates, and other free bases.

Iron is absorbed by silicates.

Not absorbed by soils are:—

Nitrogen, in the form of nitrates and of urea, *sulphuric acid* and *chlorine*, *lime*, and *magnesia*. The last two metals may be absorbed in small amounts in the presence of free phosphoric acid in the soil. A closer study of this table is necessary to understand the action and retention of various artificial manures, and it explains, for instance, that dressings with nitrogenous manures in the form of sodium nitrate are liable to loss if heavy rains follow the application, whereas if ammonium sulphate was applied this manure will be retained in the soil. This table further explains that soils lose easily all their lime and magnesium salts, which are washed away and found in the drainage waters.

Chemical analysis of soils.—For this analysis the air-dried fine earth is used, and the *moisture* still retained therein, determined by drying for several hours at a temperature of 212 degrees in a drying oven. Besides this moisture soil contains always some water in state of *combination*, which is only driven off at much higher temperatures. When igniting a soil at dull red heat this water is driven off and all the organic matters are burnt away. In order to determine the organic matters or *humus*, the amount of carbonic acid obtained by combustion of these matters is collected and weighed. *Nitrogen* in the soil is now almost exclusively determined by Kjeldahl's method, which consists in heating a small quantity of soil, usually 2 to 10 grammes, with strong, pure sulphuric acid. The organic matters are destroyed, the nitrogen combines with

the sulphuric acid, forming ammonium sulphate. For the determination of the ammonia produced, the residue is treated in a distillation apparatus with caustic soda, which drives off all the ammonia, which is collected in dilute acid of known strength. For the determination of mineral matters by the so-called **agricultural analysis,** a weighed quantity of the air-dry earth is treated for 48 hours with hydrochloric acid of certain strength (1·1 spec. gravity), the insoluble portion, after washing, drying, and igniting, is weighed as *mineral matter insoluble in HCl*; in the solution the amounts of phosphoric acid, lime, potash, &c., are determined in accordance with the usual analytical methods.

For a long time it has been a well-recognised fact that this usual agricultural analysis will not always give a true indication of the fertility of a soil, and it is not only necessary to know what a soil contains, but in what form these mineral plant foods exist, and if they are in a readily available form. For the determination of **available plant foods** many methods have been proposed, and the question still continues to be the object of important investigation in England, Germany, America, and elsewhere. Dyer proposed the digestion of the soil for seven days with a very dilute solution of citric acid; other American chemists use a very weak solution of hydrochloric acid; Maxwell, again, recommends a dilute solution of aspartic acid. The value of such determination has been practically confirmed by Ingle, who showed that a soil after a week's digestion with citric acid solution has become almost sterile. At the same time he shows that such soil after a while may recuperate itself and becomes capable again of supplying plant foods. Again, it must not be overlooked that the amount of available plant food will depend on the plant itself; wheat is quite a different feeder than lucerne, some plants again are "gross feeders," and are able to do well on a soil and extract large amounts of mineral foods on which other plants of less vigorous growth would simply perish. A series of *practical manurial experiments* will, in most cases, give a farmer a true guide to what his land and the particular crop he wishes to grow requires in the shape of artificial manures, to produce the best results.

A simple practical test for the amount of lime in soils is of some value, as we have already learned that lime is easily washed out of a soil, and many of our soils are deficient in lime. Lime may be dissolved by boiling a few grammes of soil with a strong solution of ammonium nitrate and adding ammonium oxalate solution to the filtered-off liquid, a white precipitate of oxalate of lime will prove the presence of lime in the soil. The soil may also be extracted with a boiling weak solution of hydrochloric acid; if effervescence takes place on the addition of the acid the presence of lime or magnesium carbonates is probable; to the filtered solution a few drops of ammonia are added until the liquid is alkaline, any precipitate formed consisting chiefly of iron hydroxide is filtered off, and the clear liquid again treated with ammonium oxalate. (Experiment 84.)

Besides the processes of weathering and absorption, many other chemical **changes** and **reactions** are always occurring in soils, which changes are influenced by a great number of circumstances. We have already learned something about the formation of humus, and of the continuous process of oxidation which these organic compounds undergo; again we have learned something about **nitrification,** a process by which the organic nitrogenous matters are changed into *ammonia compounds*, and finally into *nitrates* through the action of micro-organisms. A great number of moulds and bacterias seem to have the power to change nitrogenous compounds, and such a change is continually going on in manure and compost heaps and in the humus of the soil. The ammonia compounds formed by these changes are, under favourable conditions, oxidised by the aid of other micro-organisms into nitrites, and finally into nitrates. Some of the organisms, according to the latest research, are able to produce nitrates direct from organic nitrogenous compounds. A reversal of this process

"**denitrification**" may also take place, which results in the liberation and consequent loss of free nitrogen from the nitrates.

We have been told that nitrates cannot be absorbed by the soil itself, but are liable to be washed away. As a matter of fact, nitrites and nitrates are always lost in drainage waters; but this loss may be reduced by keeping the land well under cultivation. The vegetation absorbs and consumes the nitrates very readily, and the loss is reduced by drying up the soil; drying up of the soil, again, checks further nitrification.

An enormous number of micro-organisms are always found in soils; the number has been estimated to be from 1,000,000 to 60,000,000 per 1 gramme (15 gr.) of soil. The study of these organisms, "**Soil Biology,**" has become of great importance of late years, as some observers attribute the assimilation of all inorganic and organic plant foods by the roots from the soil to the action and help of the various minute organisms.

APPENDIX TO ELEVENTH LESSON.

Experiment 78.—Try a mechanical separation of different classes of soil by sieving and by boiling the fine earth with water and allowing to settle in a long cylinder.

Experiment 79.—Determine the apparent specific gravity of clay, sand, and various soils by weighing a small flaskful, taking care to have flask properly filled by adding a little at the time and shaking well down; also, weigh same flask full of water.

Experiment 80.—Weigh out equal quantities of sand, clay, and garden soil, and treat on a filter with water, and weigh the wetted samples again.

Experiment 81.—Ascertain the capillarity of different soils by filling glass tubes with the fine earth as explained.

Experiment 82.—Prepare a weak solution of ammonia by adding 10 drops of liquid ammonia to 8 oz. of water. Now put some soil into a 4-oz. wide-necked bottle, and add about 3 oz. of the prepared fluid; shake well, and pour, after a while, the liquid through a filter previously wetted. The filtrate should have no smell of ammonia, and should not give reaction with turmeric paper. Repeat the experiment with pure sand.

Experiment 83.—Prepare a solution of ferrous sulphate, taking 8 grains to 8 oz. of water. Show the presence of iron in liquid by the addition of a few drops of solution of yellow prussiate of potash and also of red prussiate of potash, which will produce blue precipitates. Add to another small quantity a few drops of a solution of barium chloride to show presence of sulphuric acid. Now treat soils with this liquid in the same manner as described in the previous experiment, and repeat the tests for iron and sulphuric acid.

Experiment 84.—Test various soils for lime by the two methods described.

QUESTIONS TO ELEVENTH LESSON.

1. What are the objects of a chemical analysis of soil?
2. What properties are ascertained by the mechanical analysis?
3. Why are capillarity and water capacity of importance?
4. Has a highly porous soil with good capillarity always a high capacity for water?
5. What is elutriation of a soil?
6. Explain the principal functions of fine earth and of the skeleton of a soil.
7. Is the chemical analysis sufficient to determine the fertility of a soil?
8. Explain the absorptive power of soils, and show how the different plant foods are absorbed.
9. How can the amount of available plant food in a soil be determined?
10. How can a farmer, in the absence of soil analysis, determine the wants of his soils with reference to manures?
11. What chemical changes go on in soils?
12. What are the causes of nearly all these changes?

"*THE FERTILISERS ACT OF* 1905."

MANURES ANALYSED AND REGISTERED TO APRIL, 1905.

Manufacturer or Agent.	—	Name of Manure.	Moisture.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate Insoluble.	Phosphoric Acid. Total.	Potash.	Degree of Fineness. Percentage of— Fine.	Degree of Fineness. Percentage of— Medium.	Degree of Fineness. Percentage of— Coarse.
			%	%	%	%	%	%	%			
H. Baxter, Croydon Bone Mill	Maryborough	Bonemeal—No. 634...	10·0	4·21	...	...	27·06	27·06	...	40 0	36·0	21·0
Redbank Freezing Works ...	Redbank ...	Redbank fertiliser—No. 630 ...	...	6·04	...	...	13·64	13·64	...	42·0	30·0	28·0
Gibbs, Bright, and Co. ...	Brisbane ...	Ohlendorff's special cane manure	...	7·4	11·0	2 0	...	13·0	3·8	...	...	...
Ditto ditto ...	ditto ...	Ohlendorff's early cane manure ...	...	4·1	7·0	1·9	·3	9·2	7·0	...	...	...
Ditto ditto ...	ditto ...	Dissolved Peruvian guano ...	...	7·4	11·0	2·0	...	13·0	2·0	...	...	...
Paul and Gray, Limited ..	Brisbane ...	No. 1—Superphosphate	...	...	17·0	...	...	17·0	..	...	...	...
Ditto ditto ...	ditto ...	XX ditto	...	...	12·0	...	...	12 0	...	...	...	...
Ditto ditto ...	ditto ...	No. 3—Wholly water soluble series	...	3·3	13·0	...	...	13·0	2·0	...	...	...
Ditto ditto ...	ditto ...	No. 5 ditto ditto	...	3·3	12·0	...	...	12·0	7·0	...	...	...
Ditto ditto ...	ditto ...	No. 7 ditto ditto	...	1·6	11·4	...	...	11·4	1·0	...	...	...
Ditto ditto ...	ditto ...	No. 9 ditto ditto	...	4·1	6·5	...	...	6 5	4·0	...	...	...
Ditto ditto ...	ditto ...	No. 11 ditto ditto	...	...	11 4	...	...	11·4	7·0	...	...	...
Ditto ditto ...	ditto ...	No. 12—Partly water soluble series	..	3 3	5·5	...	9·5	15·0	2·0	...	...	..
Ditto ditto ...	ditto ...	No. 14 ditto ditto	...	2·5	5·5	...	8·0	13·5	6·0	...	...	...
Ditto ditto ...	ditto ...	No. 18 ditto ditto	...	...	5·5	...	8·5	14·0	6·0	...	...	...

Ditto ditto ...	ditto ...	No. 19 ditto ditto	...	4·1	4·1	...	7·5	11·6	2·0	...	...	...
Ditto ditto ...	ditto ...	A—Slow-acting cheap series ...	...	·5	...	10·0	19·8	29·8	...	...	...	...
Ditto ditto ...	ditto ...	M ditto ditto ...	...	1·6	...	5·2	10·8	16·0	1·0	...	...	...
Ditto ditto ...	ditto ...	N ditto ditto ...	...	1·6	...	5·2	10·8	16·0	4·0	...	...	...
Ditto ditto ...	ditto ...	O ditto ditto ...	...	2·5	...	4·7	9·0	13·7	6·0	...	...	...
Millaquin and Yengarie Sugar Company	Bundaberg ...	A—Fertiliser	...	...	...	...	29·8	29·8	trace	3·2	...	96·8
Ditto ditto ...	ditto ...	B ditto	...	1·1	...	...	29·6	29·6	...	5·4	...	94·6
Ditto ditto ...	ditto ...	C ditto	...	·5	...	...	20·5	20·5	...	43·6	...	56·4
Ditto ditto ...	ditto ...	D ditto	...	·5	...	...	20·0	20·0	...	43·6	...	56·4
Ditto ditto ...	ditto ...	X ditto	...	...	4·2	...	11·6	15·8	3·3	4·8	...	95·2
Ditto ditto ...	ditto ...	MK ditto	...	4·8	...	...	4·2	4·2	3·3	51·4	...	48·6
Ditto ditto ...	ditto ...	Bonedust	...	3·6	...	...	23·0	23·0	trace	1·7	...	98·3
Webster and Company, Ltd. ...	Brisbane ...	Cross' cereal guano—"Crown" ...	...	3·4	9·8	...	2·7	12·5	2·6	...	...	...
Ditto ditto ...	ditto ...	Cross' superphosphate—"Crown"	...	...	16·8	1·0	1·0	18·8	...	...	...	...
Ditto ditto ...	ditto ...	Sulphate of potash—"Crown" ...	...	...	...	...	...	...	52·2	...	...	...
Ditto ditto ...	ditto ...	Root guano—"Crown"	...	1·24	10·1	·9	·9	11·9	...	...	...	...
Ditto ditto ...	ditto ...	Thomas' phosphate—"Crown" ...	...	...	...	13·3	1·1	14·4	...	82·0	18·0	...
Ditto ditto ...	ditto ...	Kainit—"Crown"	...	...	...	...	...	...	12·4	...	...	...
Ditto ditto ...	ditto ...	Sulphate of ammonia	...	20·6	...	...	...	...	...	...	...	...
Ditto ditto ...	ditto ...	Nitrate of soda	...	17·0	...	...	...	...	...	...	...	...

Besides the manufacturers whose manures were analysed and reported on in the April number of this Journal, and the firms given in the present list, 13 more firms have registered as dealers, which, however, do not appear in the list, as the firms are either agents of manures already published or for other reasons.

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Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order LYTHRARIEÆ.

NESÆA, Commers.

N. salicifolia, *H. B. and K.* (Plate. After Hooker.) A densely branched dwarf shrub; branches angular, slender; the bark usually more or less ragged, of a pale-brown colour. Leaves 1 to 2 in. long, linear-lanceolate, nearly or quite sessile, and forming from the base decurrent lines to the node below. Flowers axillary on very short angular pedicels. Calyx shortly campanulate, 6-toothed. Petals 6, yellow, obovate. Stamens 12 or more; anthers revolute-reniform. Ovary 4-celled. Seed very numerous, minute. This Brazilian plant—which has been an inhabitant of our gardens for so many years—has at last spread out into the pastures and become naturalised; and, there being some doubt as to its being fit for fodder, it might be advisable to check its spread where possible. Medicinally, the present species is said by Dr. Lindley to excite violent perspiration, while he informs us that the herbage of another species is supposed to destroy the young of cattle heavy with calf.

Hab.: Government House Domain, *J. F. Bailey*. Creek near Fig-tree Pocket, *J. Shirley*. Naturalised in both the above localities.

Order ORCHIDEÆ.

LIPARIS, L. C. Rich.

L. Swenssonii, *Bail. sp. nov.* Stems crowded from a shortly creeping rhizome thickened at the base into compressed, oval pseudo bulbs, green and smooth, often more or less covered by the membranous torn bases of the early leaves. Leaves linear-lanceolate, falcate, seldom more than one, others reduced to sheaths only, 3 to 6 in. long, 6 to 15 lines broad, bluntly acuminate, green, rather fleshy, sharply keeled, the longitudinal nerves only showing in the dead leaf. Peduncle about 3 in. long, 2 lines broad, semiterete, the margins bearing narrow, thin, transparent wings. Rhachis angular, 4 in. long, bearing 12 or more flowers. Bracts none on the peduncle, those subtending the flowers about 6 lines long, upper ones shorter, very slender, tapering to fine thread-like points. Pedicels slender, scarcely as long as the bracts. Buds subulate, from 3 to 4 lines long. Sepals and petals about 4 lines long, very narrow-lanceolate, soon reflexed over the pedicel, pale-yellow. Labellum as long as the sepals and twice as broad, the erect base closely embracing the column, the lamina elongated, flat, pale-yellow, membranous, and veined; the lower portion, which embraces the column, deep-orange and transversely wrinkled. Column pale-yellow, narrowly winged, incurved, nearly as long as the sepals. Anther-lid pale-yellow and hairy. Pollen-masses white.

Hab: Emu Vale, *Carl Swensson*.

HABENARIA, R. Br.

H. Banfieldii, *Bail. sp. nov.* Leaves 5, sheaths all rather loose, lamina of lowest one short, broad, and very obtuse, scarcely exceeding 1 in. long; the other 4 from 2 to 3½ in. long and from 1 to 1½ in. broad, the upper one more or less acuminate, margins wavy, parallel nerves 10 or more. Length of peduncle with raceme, 10 in. Bracts of the peduncle 9, the lowest about 1 in. long, lanceolate, the others becoming gradually smaller upwards. Raceme pubescent; pedicels 4 lines long, twisted, and closely appressed to the rhachis. Flowers in a more or less dense raceme, about 7 in. long. Bracts subtending

the flowers narrow-lanceolate, about 6½ lines long, scurfy, and dotted with glands. Pedicels flattened and twisted. Perianth scarcely more than 3 lines long. Labellum very much broader than the other segments, but not much longer, ending in 3 obtuse lobes, disk in the lower part glandular. Spur scrotiform.

Hab.: On hilltops, Dunk Island, *E. J. Banfield.* The specimens received contained no tubers, and flower colouring was lost from damp in packing.

[NESÆA SALICIFOLIA, *H. B. and K.*

Science.

ANALYSES OF GRASSES.

By J. C. BRÜNNICH, F.I.C., Etc., Agricultural Chemist.

PASPALUM DILATATUM, BUFFALO GRASS, AND COUCH GRASS, GROWN AT THE BOTANIC GARDENS, BRISBANE.

Cut 20th March, 1906. (Anal. No. 668/670.)

—		Paspalum.		Buffalo.		Couch.	
		Grass.	Hay.	Grass.	Hay.	Grass.	Hay.
Tons per acre cut		6·35	1·83	7·56	1·88	4·02	2·01
Moisture	%	74·18	10·86	77·42	9·10	54·88	9·99
Dry substance	%	25·82	89·14	22·58	90·90	45·12	90·01
Soluble proteids ...	%	·99	3·41	1·06	4·28	·88	1·75
Insol. ditto ...	%	1·40	4·83	1·07	4·30	2·61	5·21
Total ditto ...	%	2·39	8·24	2·13	8·58	3·49	6·96
Woody fibre	%	5·86	20·25	4·56	18·35	10·25	20·45
Pentosans	%	5·54	19·12	5·90	23·72	6·97	13·90
Starch	%	5·01	17·32	5·17	20·82	9·32	18·58
Sol. carbohydr.... ...	%	1·13	3·90	·91	3·67	2·24	4·47
Crude fat	%	·54	1·85	·50	2·00	·60	1·20
Amides chlorophyl., &c.	%	2·23	6·52	·92	3·74	7·83	15·62
Crude ash	%	4·12	11·94	2·49	10·02	4·42	8·83
Watery extract—							
Total sol. matter ...	%	4·95	19·18	4·05	16·30	7·04	14·05
Sol. nitrogen ...	%	·158	·546	·248	1·007	·140	·280
Sol. ash	%	1·45	5·00	1·29	5·20	1·89	3·78
Total nitrogen	%	·501	1·727	·438	1·754	·670	1·335
Proteid ditto	%	·382	1·317	·341	1·372	·558	1·112
Amide ditto	%	·119	·410	·095	3·82	·112	·223
Albuminoid ratio ...	%	1 : 8·5		1 : 9·0		1 : 14·3	

Paspalum and Buffalo grass were young, green samples of grass, whereas Couch grass was very much dried up and too ripe; otherwise the conditions of growth were the same for the three varieties. Buffalo grass resembles very closely in its nutritive properties to Paspalum dilatatum, and should be, as long as it is fairly young, a very valuable fodder for dairy cows.

RABBIT DESTRUCTION.

The scene of the coming experiments in rabbit destruction by Dr. Danysz is Broughton Island, 30 miles north of Newcastle. Here some hundreds of rabbits have been placed by the New South Wales Government in readiness for the doctor, who is now on his way to Australia. The "Sydney Mail," however, points out that instead of rabbits wild cats will probably be found to be the only animals awaiting annihilation. Thus, at the very beginning he'll have to change his poison. For one of the terms of the agreement is that his mixture will disagree with no other creature, but that for which it was intended. So at the threshold of his antipodean efforts an apparently insuperable obstacle appears. For anybody acquainted with the nature of the Australian wild-cat knows that, whether in the mammalian, or in the mining line, the thing is phenomenally hard to kill. The poison that would affect either or both these products is at present unknown to science.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1905.									1906.			
	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.
North.													
Bowen	5·72	0·74	0·53	0·39	0·06	4·03	0·05	3·91	0·04	12·84	8·73	6·29	0·78
Cairns	6·92	3·89	1·94	0·43	2·27	Nil	0·46	1·72	0·53	7·00	16·87	16·05	5·20
Geraldton	20·51	13·35	9 39	2·41	3·88	Nil	0·22	5·14	1·14	15·61	37·67	19·67	11·51
Herberton	2·41	2·67	1·17	0·05	0·89	Nil	0·21	1·69	0·51	15·20	3·73	4·67	1·25
Hughenden	3·84	Nil	0·41	0·47	Nil	Nil	0·13	0·07	0·14	6·11	3·93	8·47	0·12
Kamerunga	8·89	5·63	2·59	1·11	2·16	Nil	0·63	1·05	0·33	7·25	13·76	14·93	4·94
Longreach	2·41	Nil	Nil	0·22	Nil	Nil	0·06	0·77	0·17	3·99	8·61	12·25	Nil
Lucinda	23·06	3·15	1·92	4·14	0·89	0·15	0·68	2·03	0·95	10·13	49 97	25·88	10·12
Mackay	13·19	2·17	1·82	0·95	0·66	0·97	0·08	2·45	0·70	13·58	9·88	16·57	2·87
Rockhampton	8·93	0·95	0·54	0·26	0·51	0·70	0·91	1·05	4·77	4·24	15·31	8·26	Nil
Townsville	6·41	0·52	0·35	0·68	0·06	...	0·52	0·19	Nil	10·05	17·31	4·28	0·38
South.													
Barcaldine	1·56	Nil	Nil	0·30	0·04	Nil	0·15	1·49	1·30	4·00	7·07	13·84	Nil
Beenleigh	3·63	2·21	0·40	0·27	1·12	1·15	2·82	1·76	3·77	4·96	15·11	9·34	0·04
Biggenden	3·81	1·46	0·60	0·28	0·10	0·79	2·56	1·14	11·66	2·27	8·24	4·61	0·45
Blackall	5·02	0·21	Nil	0·68	0·04	Nil	0·29	1·45	0·83	5·13	11·14	11·99	Nil
Brisbane	4·50	1·10	0·39	0·28	0·65	1·32	2·22	3·63	8·21	4·16	12·71	4·85	0·45
Bundaberg	6·31	4·26	1·10	0·71	0·17	0·95	2·37	0·95	6·74	6·92	9·92	1·90	1·17
Caboolture	4·89	1·65	0·26	0·05	0·36	0·98	2·73	2·88	6·72	8·11	12·73	6·46	0·49
Charleville	3·87	0·63	0·01	0·15	0·14	0·09	0·99	0·68	0·12	1·29	10·66	3·15	0·07
Dalby	3·09	2·19	0·25	1·15	0·76	0·14	2·09	1·60	5·67	4·15	4·37	5·02	1·81
Emerald	6·00	0·72	0·06	0·50	0·30	0·29	0·64	4·41	0·80	6·12	7·81	5·22	0·08
Esk	3·52	1·68	0·33	0·52	0·57	0·65	3·21	3·65	5·98	5·49	6·79	9·04	1·74
Gatton College ...	4·22	2·56	0·26	0·98	0·27	0·54	2·59	3·59	4·73	3·75	5·33	9·43	1·40
Gayndah	4·06	1·07	0·42	0·54	0·25	0·30	2·38	1·52	5·58	2·81	9·65	5·86	0·51
Gindie	7·44	0·41	0·11	0·37	0·09	Nil	1·11	3·79	Nil	1·92	9·15	5·92	Nil
Goondiwindi	6·49	1·23	0·55	0·52	0·58	Nil	3·57	1·51	2·72	1·08	2·60	2·19	0·37
Gympie	7·05	4·49	0·79	0·78	0·70	1·85	1·48	1·44	5·03	6·06	7·38	5·58	0·45
Ipswich	2·86	1·98	0·50	0·44	0·78	0·70	2·91	3·32	3·64	5·30	7·22	3·87	0·12
Laidley	4·11	2·59	0·56	0·56	0·61	0·30	2·36	3·59	3·73	3·29	5·63	6·73	0·35
Maryborough	3·48	3·56	1·21	0·07	0·26	1·04	2·48	0·70	4·03	4·46	8·34	6·77	1·08
Nambour	6·65	4·79	1·36	0·05	0·83	1·62	4·70	0·85	5·37	7·01	16·50	9·35	1·13
Nerang	8·98	3·63	0·61	0·27	1·55	1·04	4·59	2·21	5·14	5·01	13·68	10·04	0·87
Roma	2·92	1·72	0·21	0·35	0·31	0·15	1·02	2·15	2·62	2·18	12·95	3·94	Nil
Stanthorpe	2·64	1·63	1·01	0·63	1·77	0·28	3·48	1·94	4·43	6·06	2·76	3·18	2·00
Tambo	5·12	0·12	0·06	0·36	0·46	Nil	0·85	1·57	0·39	5·09	9·05	10·63	Nil
Taroom	6·17	2·22	0·33	0·67	0·31	Nil	0·76	1·11	2·52	1·86	13·73	6·02	0·23
Tewantin	12·43	10·01	2·06	0·22	0·55	1·29	6·57	1·28	6·64	12·07	18·59	7·57	2·27
Texas	3·78	3·07	0·80	0·53	1·09	0·16	3·54	0·94	4·54	3·41	2·11	1·94	1·89
Toowoomba	5·27	3·69	0·65	1·01	0·66	0·61	2·59	2·09	3·20	6·17	6·58	8·87	2·07
Warwick	2·06	2·18	0·77	0·26	1·01	0·41	4·00	2·16	3·98	2·09	2·21	6·27	0·37
Westbrook	1·24	2·54	0·46	0·71	0·61	1·23	2·60	3·62	2·39	5·00	4·01	5·12	0·93

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian: Victorian, choice, 96s. to 98s.; second class, 86s. to 90s.; New Zealand, 100s. to 101s.; Danish, 106s. to 108s.

CHEESE.—Canadian, 62s. to 65s.; New Zealand, 63s. to 64s. per cwt.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £16 to £18 15s.; raw, £17 to £18 10s. per ton; German beet, 88 per cent., 8s. 4d. per cwt.

MOLASSES (duty, 1s. to 2s. per cwt.; for agricultural purposes only, free).—5s. to 9s. per cwt.

RICE.—Real Carolina, £26 to £28; Rangoon, £8 5s. to £12; Japan, £13 to £17s.; Java, £16 to £20; Patna, £16 to £17 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 50s. to 120s.; peaberry, 96s. to 100s.; Santos, 41s. to 49s.; Jamaica, 100s. to 125s. per cwt.

CHICORY ROOT, DRIED (duty paid).—24s. to 25s. per cwt.

ARROWROOT.—St. Vincent, 2d.; Natal, 5d.; Bermuda, 1s. 5d. per lb.

WHEAT.—Duluth, 32s. 6d. to 33s. per 496 lb.; English, 30s. to 32s. per 504 lb.; Australian, 31s. 3d. to 32s. per 496 lb.

MALTING BARLEY.—24s. to 30s. per 448 lb.; grinding, 18s. 9d. to 26s. per 416 lb.

OATS.—New Zealand, 22s. to 24s. per 384 lb.; Australian, 17s. to 18s. per 320 lb.

SPLIT PEAS.—43s. to 50s. per 504 lb.

GINGER.—Jamaica, 42s. to 65s.; Cochin, 65s. to 85s.; Japan, 24s. to 25s. per cwt.

VANILLA.—3s. 9d. to 7s. 6d., 7 to 7½ in.

PEPPER.—Capsicums, bright red, 57s.; mixed yellow, 50s.; chillies, bright red, 37s.; mixed yellow, 30s. 6d. per cwt.; black, 5d. to 5¼d.; white, 7¼d. per lb.

RUBBER.—Para, 5s. 5½d.; Ceylon "biscuits," 6s. 3d. per lb.

GREEN FRUIT.—Apples: Australian, 10s. to 17s. 6d.; West Australian, 14s. to 21s.; Tasmanian, common, 9s. 3d. to 9s. 9d.; American Cleopatras, 24s. 8d.; Canadian, 24s. to 28s. per case; bananas, per bunch, 7s. to 13s.; pineapples, 3s. to 6s. each. Oranges, Valencia, per 420, common, 8s. to 9s. 6d.; medium, 11s. to 12s.; fine selected, 17s. to 21s.; finest selected, per 714, 23s. to 30s. Lemons, Messina, per 360, ordinary to finest, 14s. to 32s. Grapes, from 9s. 6d. for common to 23s. for choicest per barrel.

DATES.—Tafilat, 35s. to 40s.; Egyptian, 18s. to 20s. per cwt.; Persian, 10s. 9d. to 13s. 6d. per case.

COTTON.—Uplands, 5¼d. to 6⅝d.; Sea Island, 13d. to 15½d. per lb. In February last extra fine American Sea Island brought from 17½d. to 1s. 10½d. per lb. at Charleston, S. Carolina, U.S.A.

COTTON SEED.—£6 12s. 6d. per ton.

COTTON-SEED OIL.—Crude, £18 2s. 6d.; refined, £20 15s. per ton.

COTTON-SEED OIL CAKE.—£4 17s. 6d.; decorticated, £8 10s. 6d. per ton.

COTTON WASTE.—24s. to 34s.; discoloured, 18s. to 25s. per cwt.

LINSEED.—43s. to 44s. per qr.

LINSEED OIL.—£20 12s. 6d. per ton.

LINSEED OIL CAKE.—£7 5s. to £8 per ton.

OLIVE OIL.—£37 per tun (252 gallons).

COPRA.—£17 10s. per ton.

COCOANUT OIL.—£28 10s. per ton.

BEESWAX.—Australian, £7 10s. per ton.

LUCERNE SEED.—58s. to 64s. per cwt.

CANARY SEED.—60s. to 86s. per quarter = 7s. 6d. to 10s. 9d. per bushel.

HONEY.—16s. to 25s. per cwt.

MANILA HEMP.—£40 to £42 15s. per ton for best.

NEW ZEALAND HEMP.—£32 to £33 per ton for best.

FOURCROYA (Mauritius Hemp).—£30 15s. per ton for best.

SANSIVIERIA (Murva) HEMP.—Bright, £40; dark, £35 per ton.

DIVI DIVI.—£6 10s. per ton.

TAPIOCA (duty, 5d. per cwt.).—$2\frac{1}{2}$d. per lb.; pearl, 20s. to 23s. per cwt.

EGGS.—French, 10s. to 10s. 6d.; Danish, 7s. 3d. to 10s. per 120.

BACON.—Irish, 62s. to 68s.; American, 46s. to 53s.; Canadian, 56s. to 62s. per cwt.

HAMS.—Irish, 86s. to 108s.; American, 49s. to 57s. per cwt.

PORK (frozen).—$5\frac{1}{2}$d. per lb.

TALLOW.—Mutton, fine, 32s.; medium, 27s. 6d.; beef, fine, 30s.; medium, 27s. 6d. per cwt.

POULTRY (Smithfield).—Ducks, 3s. 6d. to 5s.; geese, 6s. to 7s.; Surrey fowls, 3s. to 5s.; Lincolnshire, 2s. to 2s. 6d.; Essex, 2s. 6d. to 3s. 6d.; Irish fowls, 2s. to 2s. 6d.; feathered pigeons, 9d.; turkey cocks, 7s. to 12s.; hens, 5s. to 7s.; English hares, 1s. to 2s. 6d; wild rabbits, 9d. to 10d.; Australian rabbits, 13s. to 13s. 6d. per crate. Poultry (ex "Damascus"), Aylesbury ducks, 3s. to 3s. 6d; coloured, 2s to 2s. 6d.; chickens, 2s. to 3s. per pair net.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef, of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.

(Crossbred Wethers and Merino Ewes.)

	May 12.	May 19.
Canterbury, light (48 lb. to 56 lb.)	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
Canterbury, medium (56 lb. to 64 lb.)	$3\frac{13}{16}$d.	$3\frac{13}{16}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$3\frac{1}{2}$d.	$3\frac{1}{2}$d.
Southland (56 lb. to 64 lb.) ...	None offering.	
North Island (56 lb. to 65 lb.), ordinary	$3\frac{1}{2}$d.	$3\frac{3}{8}$d.
North Island, best brands (56 lb. to 65 lb.)	$3\frac{5}{8}$d.	$3\frac{1}{2}$d.

Australian Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	$3\frac{1}{8}$d.	$3\frac{1}{8}$d.
Light (under 50 lb.)	$3\frac{1}{4}$d.	$3\frac{1}{4}$d.

River Plate Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	$3\frac{1}{4}$d.	$3\frac{1}{4}$d.
Light (under 50 lb.)	$3\frac{1}{2}$d.	$3\frac{1}{2}$d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36 lb.)	$4\frac{3}{4}$d.	$4\frac{11}{16}$d.
Canterbury, medium (36 lb. to 42 lb.)	$4\frac{1}{2}$d.	$4\frac{5}{8}$d.
Canterbury, heavy (42 lb. to 50 lb.)	$4\frac{9}{16}$d.	$4\frac{5}{8}$d.
Southland (28 lb. to 42 lb.) ...	None offering.	
North Island (28 lb. to 42 lb.) ...	$4\frac{3}{8}$d.	$4\frac{1}{4}$d.

Australian Lambs.

30 lb. to 40 lb. best brands (28 lb. to 42 lb.)	$4\frac{1}{16}$d.	$4\frac{1}{16}$d.
30 lb. to 40 lb., fair quality (28 lb. to 42 lb.)	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
30 lb. to 40 lb., inferior quality (28 lb. to 42 lb.)	None offering.	

River Plate Lambs.

28 lb. to 42 lb.	$3\frac{3}{4}$d.	$3\frac{3}{4}$d.

New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.) ...	$2\frac{1}{2}$d.	$2\frac{7}{16}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{1}{4}$d.	$3\frac{1}{16}$d.

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (180 lb. to 220 lb.) ...	$2\frac{3}{4}$d.	None offering.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.) ...	$2\frac{5}{16}$d.	$2\frac{5}{16}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{13}{16}$d.	$2\frac{13}{16}$d.

QUEENSLAND TIMBERS.—So much interest has been evinced in the Southern markets in our Queensland hard and soft woods, and the scrub timbers suitable for ornamental work and high-class furniture, that we strongly advise holders of land containing such timbers to refrain as much as possible from destroying them. Scrub timbers, such as yellow-wood, ivory-wood, red cedar, beech, hoop, Kauri and Bunya pine, crow's ash, silky oak, and many of the acacias, will all find a ready sale in the near future at remunerative prices. The same applies to the forest timbers—tallow-wood, swamp mahogany (for piles, unbarked), ironbark, grey, spotted, red, and other gums (excepting white gum), red stringy bark, &c. The great demand both locally and in South Africa for Queensland railway sleepers, bridge girders, and piles must result in higher prices, and those who are wise enough to preserve the timber on land not required for cultivation will find that timber pays better than corn.

TESTING SEEDS.

The nurseryman and seedsman are frequently blamed for selling bad seed, when the fault more often lies at the door of the purchaser. We have never had cause to complain of bad seed from our local seedsmen. On the contrary, on one occasion last year we wanted some parsnip seed, and three nursery men refused to sell it as it was old seed, the new crop not having arrived. They were scarcely even willing to give it away, preferring to destroy it to getting a bad name. When buying seeds, it is a very simple matter to test them, in two or three ways. Rapidly germinating seeds, such as mustard, cress, radish, &c., may be laid on wet flannel in a warm shady place. The good seeds will soon show themselves. Another way is to fill a pot with wet sand. Scatter the seeds on the surface, and cover the pot with a piece of glass. Say you count out 100 seeds for planting, there should, if the seed be fresh, be from 90 to 95 which germinate. Remove each seed which has struck, keep a tally of them. If more than 5 per cent. fail to grow, the seed is not too good, and, in order to secure a good stand, more will have to be purchased than if it were fresh. These easy tests will show the gardener whether his cultivation, the birds, or the seller of the seeds is to blame.

Plate XXX.

THE TREWHELLA MONKEY JACK IN ACTION.

1. Starting the Tree. 2. Tree Uprooted.

General Notes.

A SIMPLE REMEDY FOR A CORN.

The following is said to be a simple remedy for corns:—Tie a piece of lemon on the corn at night for five nights, leaving it on all night. Then soak the foot in warm water, and the corn can be easily removed. When the root of the corn is taken out cover the toe with collodion or some other preparation to protect the skin, which will be sensitive. Unless the tender skin is protected it will soon form another corn. A piece of cotton saturated with vaseline and put over the toe will also effect this purpose.

NEW VARIETIES OF COTTON.

The Washington Department of Agriculture announces that it has developed a number of new breeds of cotton, which promise almost to double the value of the cotton crop wherever they are used. These new cottons have been bred from the native and short staple Upland variety, and are from a half to three-quarters of an inch longer in fibre than cotton grown from the parent seeds.

PREPARING COTTON FOR MARKET.

Those who are now getting the cotton crop ready for market, will do well to be careful that the lint is thoroughly dry before being baled. Especially should this be attended to in the case of Sea Island and the long-stapled Caravonica. If at all damp it will become matted when pressed, and will then suffer a considerable diminution in price. Another point worthy of attention is, that Sea Island cotton must not be subjected to too great pressure. Upland varieties may be pressed till the bale is as hard as a board, but the long-staple kinds are injured by too great pressure, as the fibres become tangled and matted.

VISITORS TO THE QUEENSLAND AGRICULTURAL COLLEGE.

As the irregular, and occasionally unforeseen, visits of parties of farmers and others desiring to obtain information from an inspection of the methods of agriculture, dairying, and stock-raising adopted at the College, are calculated to seriously interfere with the routine of the institution, it has been decided to set apart the second Wednesday in each month for such visits. Notice of the proposed visit should be given to the Under Secretary for Agriculture at least a week beforehand. Parties of visitors can obtain hot water and milk if they require such supplies.

TREE AND STUMP EXTRACTION.

A demonstration of the power of the Trewhella stumping jacks (described in the issue of the Journal of December, 1905) in extracting trees and stumps was given on 9th May, at Whitecliff, Albion, in the presence of about eighty interested spectators. The land here is exceedingly hard and rocky, and in consequence of the continued dry weather, it almost had the consistency of cement, so that the trial was made under most adverse conditions. Notwithstanding this drawback, several trees and stumps were successfully negotiated, the large tap-roots being forcibly broken. One tree was lifted perpendicularly out of the ground, by means of two jacks working against opposite sides of the tree. The hardness of the ground necessitated putting three men on to the

lever, whereas two could easily have done the work in less time had the ground been softer. The opinion of some scrub farmers present was, that there were very few scrub trees which could not be quickly extracted by the smallest or "Special Double Purchase Wallaby" jack. We were informed that one farmer had, with the help of one man, taken out twenty-six stumps and trees in forest land, ranging from 8 inches to 18 inches in diameter, in four hours, an average of about nine minutes to each stump, and only in one case were the surface roots cut before applying the jack. When it is considered that after scrub is felled and burnt off, it takes three years for the stumps to rot sufficiently to be easily removed, and that all cultivation during that time must be done by hand, it would seem that the employment of a simple machine which can be carried on a man's shoulder, and with the help of which forty or fifty stumps can be taken out daily, must prove of great value in advancing the time when the plough can be used and expensive hand labour done away with.

The accompanying illustrations, taken on the ground, were kindly supplied to us by Mr. A. Robinson, Brisbane agent for Messrs Trewhella Bros. They show the position of the jack when commencing operations, and the falling tree after about five minutes' work.

QUEENSLAND AGRICULTURAL COLLEGE OLD BOYS' UNION.

BY "INDEREY," Wetheron.

It is pleasing to feel that the union is of service to those ex-students who are anxious to find the whereabouts or occupation of their old friends. Many have made inquiries from the secretary, and he is pleased to supply addresses or any possible information.

It was interesting to read Mr. Philippe Rochat's contribution to the May number of the "Agricultural Journal," and we hope that those who found it inconvenient to write for the months notified will soon favour us with an article. Unfortunately, the editor has had no occasion to notify that we are crowding out our space.* Sorry Mr. Rochat disposed of his dairy herd, for though he may not at present have the assistance he states to be necessary, he, at any rate, leads the way among Old Boys in that direction.

"Orange Blossom's" account of his practical experiences, published in the March number, is certainly to the point, and gives us a splendid idea of the doings of Montville Settlement. We hope he will be as successful when wearing the blossom as he has been when using its name as a *nom de plume.*

Our thanks to Mr. Evans for his interesting account on "Onion Culture," and hope it will not be long before that gentleman finds time to pen us something more.

The hon. secretary of the union notifies the members that what promises to be a record gathering of "Old Boys" will take place next August. [Where? Ed.] He also draws attention to the fact that subscriptions (5s.) to the union are now due, and solicits the hearty support of all Old Boys. Receipt of subscriptions will be acknowledged through the "Agricultural Journal." It is requested that subscriptions be paid promptly, as the subcommittee appointed to arrange the necessary details in connection with the coming annual dinner will be greatly assisted thereby. All subscriptions should be forwarded to the hon. "Secretary, Q.A.C.O.B.U., 'Inderey,' Wetheron, *viâ* Maryborough."

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

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* None of our contributors amongst the "Old College Boys" have erred in this respect. We wish that all our correspondents would follow their example. Still we always have two pages at least at the O.B.U. service, and we should like to see them filled.—ED. "Q.A.J."

Answers to Correspondents.

BOWSTRING HEMP (*MURVA*).

Enquirer, Johnstone River.—

This plant is the *Sansivieria zeylanica.* It is a stemless perennial, belonging to the Liliaceæ, and is well known in many Queensland gardens. The dark-green radical leaves are linear-lanceolate in shape, and are freely spotted on each side with lighter shades of the same colour, often with dark transverse bands. The fibre possesses in a wonderful degree those properties demanded of a first-class cordage material. It is white, fine, soft, pliant, and lustrous, and resembles pine-apple fibre in many of these qualities. Its resistance to moisture is very marked, and its tenacity is equal to sisal, to which, in most other respects, it is superior. It is propagated by division of the rhizomes, or the leaves may be cut into lengths of a few inches and placed in the ground, when suckers will show in a few weeks. The plants soon become established, and a full crop may be harvested in about two years. After cutting, the growth becomes denser, and the plants will continue productive for many years. No extremes of rain or drought need be feared, as Sansivieria appears to be indifferent to either. Forty pounds of leaves yield about 1 lb. of dry fibre, and two crops, consisting in all of about 3,500 lb., may be obtained from an acre of about 3,000 plants. For further information about this valuable fibre plant, see the article in our issue of October, 1906.

DEHORNING CATTLE.

Dairyman, Caboolture.—

In the article on the subject of dehorning, only young stock was considered. Your question concerning dehorning bulls is, we think, fully answered in a short article in "Farm and Home," giving the experience of several breeders in America, as to the effect of dehorning bulls, which we reproduce in another part of this Journal.

GETTING RID OF SORREL.

S. Giles, Blackall.—

Various means have been tried in many parts of Australia to get rid of this weed, but the only successful method is to turn sheep on to the infested land. They soon get a liking for it, and will, by keeping it from flowering, cause its gradual extinction.

ANGORA GOATS.

S.N.P. asked us in March last for information concerning a book on Angoras. Mr. P. R. Gordon, late Chief Inspector of Stock, and Mr. A. Aubry, Peachester, have given us the name of the author, S. C. Cronurîght Schreiner, brother of Olive Schreiner. Mr. Gordon says it is a valuable and standard work on the Angora goat. Mr. Aubry obtained it through Mr. Hariss, bookseller, Brisbane; price, 13s. 6d. He says it contains a great fund of information, and he recommends it strongly to every Angora breeder, as opinions differ so much. After years of trying, he finds that the Angora is a very delicate animal, and wants a good deal of care. As to clearing the scrub, they hardly eat any of the eucalyptus bushes, only the very best of grass-tops and a few bushes.

"I build," says Mr. Aubry, "a big shed and house the goats every night and in rainy weather; they have a thick layer of grass or hay as bedding,

and every care is bestowed on them. As an old student of medicine and chemistry, I should be able to look well after them, but, all the same, I had two cases of peritonitis, owing to one goat kicking the other in the full stomach, with fatal results. Rupture of the stomach, and the contents of the stomach going into the abdomen was the evidence of the post mortem. There is nothing to be done. Another goat could not ruminate for two days, and evidently suffered. I gave some stimulants and lemon peel, which they like very much, and I think it did more good than the medicine. My boy does the castrating all right, but I am sorry to say 'not under aseptic cauteles'—it is a horror for me to see any operation without anti or asepsis. This is my whole medical experience with the animals, and I suppose they are not subject to disease. I saw a young nanny lying on the ground, and a thorough examination showed a tick behind the ear, and there was slight paralysis of the hind legs. The animal is slowly recovering. A very few of the older goats have had ticks, but never suffered any ill effects from them."

Times of Sunrise and Sunset, 1906.

Date.	May.		June.		July.		August.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·32	5·0	6·40	5·4	6·30	5·18
2	6·14	5·15	6·32	5·0	6·40	5·4	6·29	5·18
3	6·15	5·14	6·32	5·0	6·40	5·4	6·29	5·19
4	6·15	5·13	6·32	5·0	6·40	5·5	6·28	5·19
5	6·16	5·13	6·33	5·0	6·40	5·5	6·28	5·20
6	6·17	5·12	6·33	5·0	6·40	5·5	6·27	5·20
7	6·17	5·12	6·34	5·0	6·40	5·6	6·27	5·21
8	6·18	5·11	6·34	5·0	6·39	5·6	6·26	5·22
9	6·18	5·11	6·35	4·59	0·39	5·6	6·25	5·23
10	6·19	5·10	6·35	4·59	6·39	5·7	6·24	5·24
11	6·19	5·10	6·35	4·59	6·39	5·7	6·23	5·24
12	6·20	5·9	6·35	4·59	6·39	5·7	6·22	5·25
13	6·20	5·8	6·36	5·0	6·39	5·8	6·21	5·25
14	6·21	5·8	6 36	5·0	6·39	5·8	6·20	5·26
15	6·21	5·7	6·36	5·0	6·38	5·9	6·19	5·26
16	6·22	5·7	6·36	5·0	6·38	5·9	6·18	5·26
17	6·23	5·6	6·36	5·0	6·38	5·10	6·17	5·27
18	6·23	5·6	6·36	5·1	6·37	5·10	6·16	5·27
19	6·24	5·5	6·36	5·1	6·37	5·11	6·15	5·28
20	6·25	5·5	6·37	5·1	6 36	5·11	6·14	5·28
21	6·25	5·4	6·37	5·1	6·36	5·12	6·13	5·29
22	6·26	5·4	6·37	5·1	6·35	5·12	6·12	5·29
23	6·26	5·3	6·37	5·2	6·35	5·13	6·11	5·30
24	6·27	5·3	5·38	5·2	6·34	5·14	6·10	5·30
25	6·27	5·2	6·38	5·2	6·34	5·14	6·9	5·31
26	6·28	5·2	6·38	5·2	6·33	5·15	6·8	5·31
27	6·28	5·1	6·38	5·2	6·33	5·15	6·7	5·32
28	6·29	5·1	6·39	5·2	6·32	5·16	6 6	5·32
29	6·30	5·0	6·39	5·3	6·32	5·16	6·5	5·32
30	6·31	5·0	6·39	5·3	6·31	5·17	6·4	5·33
31	6·31	5·0	...	...	6·31	5·17	6·4	5·33

PHASES OF THE MOON.

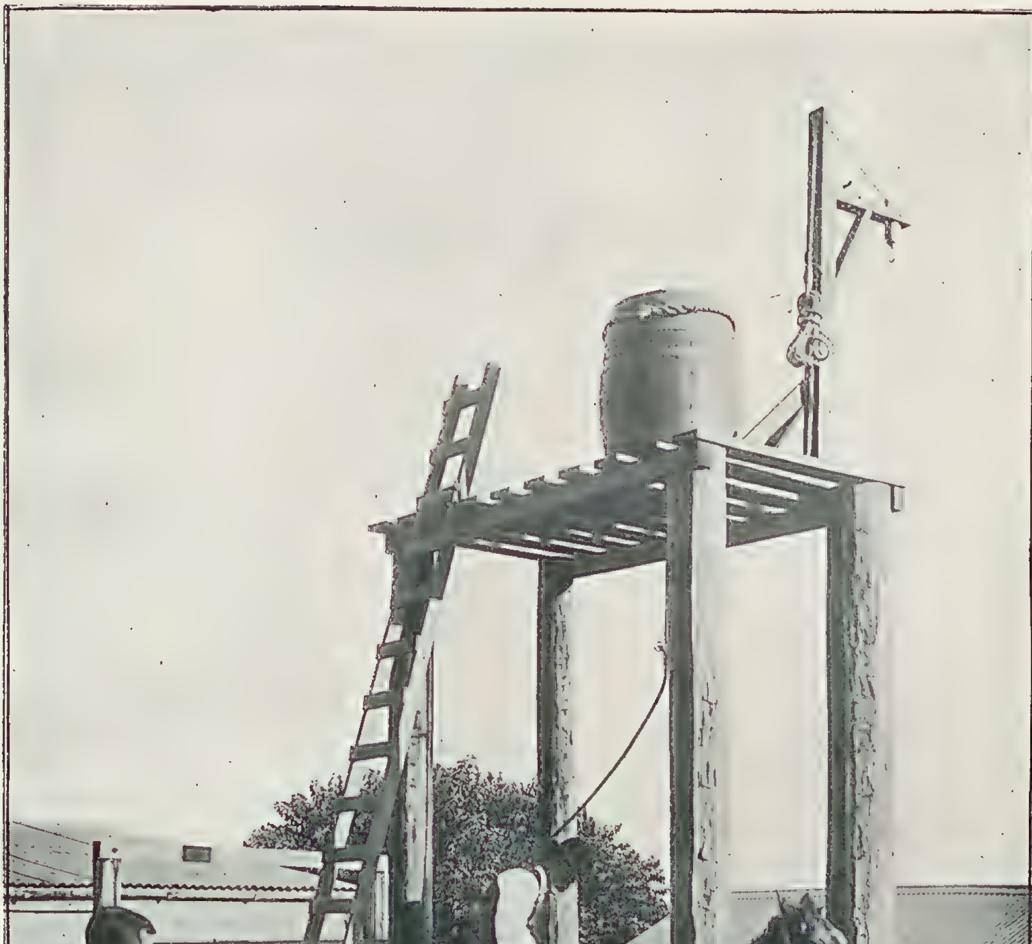
			H.	M.	
1 May	☾	First Quarter	5	6	p.m.
8 „	○	Full Moon	12	9	„
15 „	☽	Last Quarter	5	2	a.m.
23 „	●	New Moon	6	0	„
31 „	☾	First Quarter	4	23	„
6 June	○	Full Moon	7	11	p.m.
13 „	☽	Last Quarter	5	34	„
21 „	●	New Moon	9	5	„
29 „	☾	First Quarter	12	18	„
6 July	○	Full Moon	2	27	a.m.
13 „	☽	Last Quarter	8	12	„
21 „	●	New Moon	10	59	„
28 „	☾	First Quarter	5	56	p.m.
4 Aug.	○	Full Moon	10	59	a.m.
12 „	☽	Last Quarter	0	47	„
19 „	●	New Moon	11	27	p.m.
26 „	☾	First Quarter	10	42	„

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1906.	Rockhampton.		Townsville.		Cooktown.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
May	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June	1 m.	19 m.	10 m.	44 m.	7 m.	55 m.
July	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.
August	5 m.	15 m.	18 m.	36 m.	16 m.	46 m.

By an oversight, the tables of the phases of the Moon, Sunset and Sunrise, were incorrectly given in the issues of the Journal for March and May.

Plate XXXI.



Crush and Spray,
Used by Department of Agriculture and Stock at Brisbane, for Disinfecting Stabled and Groomed Horses prior to same being allowed to proceed to clean country.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	APRIL. Prices.
Apples, Eating, per packer, Hobart ...	7s. to 8s.
Apples, Eating, per packer, Hobart, best sorts ...	10s.
Apples, American, per packer ...	...
Apples, Cooking, per packer ...	8s. to 9s.
Apples, Local, per packer ...	...
Apricots, quarter-case ...	...
Bananas, per dozen (scarce, good demand for local grown) ...	2¾d. to 4d.
Bananas, per dozen ...	...
Grapes, per lb. ...	2d. to 3½d.
Cherries, quarter-case ...	...
Comquats, case ...	2s. 6d. to 4s.
Lemons, per case, Local ...	5s.
Lemons, per case, Imported ...	6s. 6d.
Mangoes, half-case ...	...
Oranges, per packer, Imported ...	...
Oranges, Local, per packer ...	2s. 6d. to 3s. 6d.
Passion Fruit, quarter-case (scarce) ...	4s. 6d.
Papaw Apples, per case ...	...
Peaches, quarter-case ...	...
Peanuts, per lb. ...	2½d.
Pears, Imported, per quarter-case, best ...	6s. to 7s.
Pineapples (rough leaf), best sorts, per dozen ...	2s. 6d. to 4s.
Pineapples (smooth leaf), best sorts, per dozen ...	4s. to 4s. 6d.
Plums, Imported, quarter-case ...	5s. 6d.
Plums, Local, quarter-case ...	...
Persimmons, quarter-case ...	4s. to 5s.
Quinces, Imported, per case ...	6s.
Strawberries, per quart ...	...
Tomatoes, quarter-case ...	2s. 6d. to 3s.
Watermelons, per dozen ...	...
Rockmelons, per dozen ...	...

SOUTHERN FRUIT MARKET.

Bananas, Fiji, per case ...	10s. to 11s. 6d.
,, ,, per bunch ...	6s. to 8s.
Lemons, per gin case ...	...
Queensland Oranges, per case ...	4s. to 5s.
Mandarins, case ...	6s. to 7s.
,, Washington Navels, per double case ...	...
Pineapples, case ...	10s. to 12s.
,, per double case ...	...
Rockmelons, case ...	...
Peaches, half-case ...	4s. 6d. to 5s. 6d.
Tomatoes, half-case ...	1s. 6d. to 3s.
Quinces, per case ...	2s. 6d. to 4s. 6d.
Chillies, per bushel ...	4s. to 4s. 6d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MAY.

Article.		MAY. Prices.
Bacon (Pineapple)	lb.	7d. to 8½d.
Barley, Malting	bush.	4s.
Bran	ton	£5 5s.
Butter, Factory	lb.	9d. to 9½d.
Chaff, Mixed	ton	£3 15s.
Chaff, Oaten	"	£4 2s. 6d. to £4 7s. 6d.
Chaff, Lucerne	"	£3 10s. to £4 10s.
Chaff, Wheaten	"	£2 7s. 6d.
Cheese	lb.	6d. to 6½d.
Flour	ton	...
Hay, Oaten	"	£5 5s. to £5 15s.
Hay, Lucerne	"	£2 10s. to £4
Honey	lb.	2d. to 2½d.
Maize	bush.	2s. 4d. to 2s. 5d.
Oats	"	2s. 9d. to 3s.
Pollard	ton	£5 5s.
Potatoes	"	£5 10s. to £10.
Potatoes, Sweet	"	£1 15s. to £2 5s.
Pumpkins	"	£1 5s. to £1 15s.
Wheat, Milling	bush.	4s. 3d.
Wheat, Chick	"	3s. to 3s. 8d.
Onions	ton	£7 10s. to £8 10s.
Hams	lb.	8½d. to 10d.
Eggs	doz.	8¾d. to 1s. 2d.
Fowls	pair	2s. 1d. to 3s. 3¾d.
Geese	"	5s. to 5s. 6d.
Ducks, English	"	2s. 7½d. to 2s. 11½d.
Ducks, Muscovy	"	2s. 9d. to 3s. 5d.
Turkeys, Hens	"	4s. 11d. to 5s. 11d.
Turkeys, Gobblers	"	7s. 9d. to 10s. 3d.

ENOGGERA SALES.

Animal.	APRIL. Prices.
Bullocks (Extra Prime)	
"	£8 to £9 12s. 6d.
Cows (Extra Prime)	...
"	£6 to £7
Merino Wethers	21s. 6d.
" Ewes	19s. 3d.
C.B. Wethers	24s. 3d.
" Ewes	21s. 9d.
Lambs	16s.

Orchard Notes for July.

By ALBERT H. BENSON, M.R.A.C.

The remarks that have appeared in the Orchard Notes for the last three months anent the handling, packing, and marketing of citrus fruits apply equally to the present month.

The pruning of all kinds of deciduous fruit trees should be completed during the month. All prunings should be gathered and burnt, and the tree should then receive a thorough spraying with the lime, sulphur, and salt wash, which is the best all-round winter spray, acting both as an insecticide and a fungicide. After pruning and spraying, the orchard should be well ploughed, so as to bury all weeds and trash that may have accumulated, to sweeten the soil, and to break up any pan that may have been formed by summer cultivation.

Citrus trees, from which the fruit has been gathered, should be pruned now, the pruning to consist of cutting out all dead branches or branches having borers in them, as well as all branches, thorns, or twigs growing in the centre of the tree which are not required. The centre of the tree must be kept well opened up, as, unless this is done, the superfluous wood only forms a harbour for all kinds of insect and fungus pests, and, in addition to this, where the tree is not well pruned out in the centre, it is impossible to do good work with the spray pump.

As already stated, all the prunings from the tree should be gathered and burnt, as this is the surest way of destroying any scale insects, borers, or fungus pests with which they may be infested. If you have no spray pump, then the above mixture should be applied with a brush. It will destroy all scale insects with which it comes in contact, and will remove all moss and lichen as well as stop the spread of canker or bark rot.

The planting of deciduous trees can be continued throughout the month, but it is not advisable to delay it more than can be helped, as when the trees are planted, even though they make no leaf or wood growth, they begin to throw out adventitious rootlets which are ready to start work as soon as the first top growth takes place. Don't plant too deep: the depth at which the young trees stood in the nursery is the right depth; trim the roots carefully, so as to remove all bruised portions; spread the roots out well, so that they may get a good hold of the ground, and always spread a little fine top soil round them, as this will be conducive to the rapid formation of new roots.

Cut back hard at planting, and don't be afraid that you will spoil your tree by doing so. Failure to cut hard back prevents the formation of a strong, well-grown, symmetrical tree, and always tends to injure the future vigour and growth of the tree.

See that all trees that are planted, whether deciduous or evergreen, are free from pests, as it is much easier to keep disease out of the orchard by planting clean trees than it is to stamp out disease once it has got a fair hold. Where the trees are infested with scale insects of any kind, they should be treated by hydrocyanic acid gas, as recommended and described from time to time in this Journal. If this treatment of the young trees is carefully carried out, there is every chance of their remaining clean for a considerable time after they are planted.

Do not plant rubbish; only plant those trees that your soil and climate are adapted for. Do not try to grow fruits that will only end in failure, as no grower who is dependent on fruit culture for his living can afford to grow fruits that can be produced both better and cheaper by others under more suitable conditions; but he must confine his energies to the culture of those fruits that prove a commercial success.

It costs just as much to prepare the land for and to plant, prune, spray, manure, cyanide, and generally look after an inferior variety of fruit tree, or a variety of fruit tree that is unsuitable to the climate, and from which no return of any value can ever be obtained, as it does to grow a variety that is suitable to the soil and climate, that will produce superior fruit, and for which there is always a ready sale. Therefore, I again repeat that no grower who is dependent on fruit culture for his living can afford to spend time or money in the growing and looking after unsuitable varieties of fruit trees.

Farm and Garden Notes for July.

FIELD.—With a fairly good season the field operations generally for the month will consist of preparing the land for cotton, potatoes, maize, oats, barely, vetches, rye, tobacco, sisal hemp, sugar-cane, field carrots, mangolds, &c. Prairie and other grasses, if not already sown in March and April, may yet be sown. In suitable localities early potatoes may be planted, but the young shoots will run the risk of being nipped by frost. There is no better time for sowing lucerne. The soil should be a deep calcareous loam, where the roots can penetrate deep down into the subsoil in search of moisture and plant food. If the subsoil is at all tough, it should be loosened to at least a depth of 18 inches, by the help of the subsoil plough, but on no account should the subsoil be brought to the surface. The land must be brought to the finest possible tilth, to give the seed every chance of germinating. After sowing, run a light harrow over the land to cover the seed. From 10 lb. to 12 lb. of seed is sufficient for an acre. During suitable weather, rice may be sown in the North and on the Southern coast. The coffee crop should now be harvested. Yams and turmeric should be unearthed.

KITCHEN GARDEN.—Full sowings may be made of cabbage, carrot, broad-beans, lettuce, parsnips, beans, peas, radishes, leeks, spring onions, beetroot, eschalots, mustard, and cress, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad-beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, and squashes during the last week of the month. In colder localities it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops. Plough up or dig all vacant land, and let it lie in the rough until required. If harrowed and pulverised before that time, the growth of weeds will be encouraged, and the soil is deprived of the sweetening influences of the sun, rain, and air.

FLOWER GARDEN.—The roses will now want looking after. They should have already been pruned, and now any shoots which have a tendency to grow in wrong directions and to crowd the centre of the bush should be rubbed off. Overhaul the ferneries, and top dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses, where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemums, tricolour, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

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